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Electricity and the Ice Crop

The mildest winter season within man's memory for many decades, which has fairly turned New York into a winter resort, will not prove itself an unmixed blessing if the next three months are like the last. What the ultimate consumer is now saving in fuel he will be likely next summer to expend for ice, and it may not buy a great deal of ice at that. Fortunate will be the community which draws its supply, not from natural sources, but from the producers of the artificial brand. Even if a normal crop of natural ice is secured as the result of a few weeks of real winter, the work of harvesting it is likely to create an exceptional demand for labor, with attendant increase in cost. Next summer's ice market promises, at the present time, to be a fairly stiff one, and the outlook is encouraging for the central-station managers who have gone into the artificial-ice business as a profitable side line.

Electric Starting Motors for Gasoline Cars

While the automobile shows held in New York City during the past two weeks were lamentably lacking in exhibits of electric pleasure and commercial vehicles, there was evidence on all sides of the great changes which have taken place during the past year in the gasoline engine starter field. Indeed, among the really big things of the year in the gasoline automobile field are the electric-lighting and engine-starting systems which have been evolved. Last season the explosive-gas type of self-starter predominated, but this year the electric type of engine starter occupies the premier position. About 70 per cent of the gasoline vehicles which are using starters at all are fitted with electric starters, and while previously such refinements were only to be found on expensive cars, this year witnesses their introduction on cars of all classes. Three types of electric lighting and starting systems are to be had—the single-unit system, comprising a motor-generator set; the double-unit system, consisting of a separate generator and a separate motor for starting or a motor-generator set and a magneto, and the three-unit system, made up of an individual generator, cranking motor and magneto. A storage battery is of course necessary for all three systems. Where a motor-generator set is employed, the unit is in positive engagement with the engine and rotates when the latter is in motion. On the other hand, the cranking motor, where such is used, is only in engagement with the engine when it is desired to start, and when the engine is running under its own power the cranking motor is at rest. The voltages used in electric cranking and lighting systems range from 6 to 24 volts. Certainly the advent of any system which by the touch of a switch will automatically start an engine and do away with the laborious process of cranking would be received with wide-open arms by users of gasoline machines. Having found the electric lighting and starting system reliable and convenient, it may be that users of gasoline cars will eventually find electric cars to be more so.

High-Speed Alternators

At the last meeting of the American Institute of Electrical Engineers, reported elsewhere in this issue, an interesting paper on turbo-alternator design was read by Mr. B. G. Lamme, who has had much experience with that type of machine. The paper points out that the trend of design in recent years has been to increase the output of turbo-alternators for central-station service, and thus greatly to increase the intensity of heat generation per unit of volume, or per unit of surface, in these machines. This has called for a corresponding intensity of cooling action. Very powerful forced ventilation is now needed in order to keep down maximum working temperatures. The paper is, moreover, a plea for the use of mica as the insulating substance in the windings of such machines, in order to increase the safe range of working temperatures. This increase in acceptable temperature range is, indeed, not a mere incidental advantage; it is an inevitable necessity, without which further progress in turbo-generator design would soon be halted.

Optimism for the Industry

"I have learned to be an optimist concerning anything electrical," was the inspiring statement of a prominent central-station official in a recent address before an audience made up chiefly of the younger employees of a neighboring utility company. The remark was occasioned by some doubts the speaker had himself expressed concerning an electrical process whose usefulness is still in question, although its possibilities seem enormous. Unable to satisfy himself of the finality of the claims made either pro or con by scientific advocates and skeptics, and yet determined to prove the truth to his own mind, the official has set up experimental apparatus and is going after his own results, animated by the professional optimism best described in his own words. As the electrical industry becomes more and more conventionalized, there is increasing need for such broad catholicity of view and liberal attitude of mind, which are ready to consider the possibilities of even the unproven. It must not be forgotten that the mighty energy-transmission schemes of to-day are but exaggerations of the feeble electromagnetic effects first discovered by Henry, and that the triumphant conquest of the electric motor in every branch of modern industry exemplifies simply a concrete optimism that was not discouraged by the ineffectiveness of the original means at hand. So many times has the electrical industry seen barely hopeful phenomena developed into great commercial

successes that an age which has produced the wonderful development of the past few years can well afford to be optimistic in withholding too quick judgment on electrical futurities that now seem open to controversy.

Central Georgia Transmission Plant

One of the interesting features of the practice of the last few years in energy transmission is the tendency to separate the generating and distributing interests of the same plant, so that the energy supply is sold at wholesale from the generating plant to distribution companies, which assume the burden of finding and developing the market and bringing the electricity to it. Whether this is likely to be a growing tendency or simply represents a phase of the general development of transmission one can hardly say, but the tendency certainly has resulted in the building of a number of transmission lines which might not have been undertaken so promptly had the original organization, busy with the development of hydraulic privileges, been relied upon to carry through the whole process. The Central Georgia Transmission Company, whose system is described elsewhere in our columns, is an organization for the sale of energy over a considerable territory in middle Georgia contiguous to the region already supplied with energy by the Central Georgia Power Company, from which the transmission company buys its energy on a long-term contract. The transmission lines connect Atlanta, Hampton and Monticello with the system of the generating company, and substations in each place take care of the local distribution. Energy is transmitted at 66,000 volts and delivered to customers at 11,000 or 2300 volts. The conductors forming each circuit are on a single side of the pole, but not directly over each other, being slightly staggered to lessen the possibility of contacts due to a heavy load of sleet. It is a simple precaution to take, although it strikes one as practically quite unnecessary with so conservative a span-length as that here used, about 550 ft.

Each tower carries two stranded steel cables grounded at each pole for protection against lightning, which is considerably to be feared in this particular territory. The transmission circuits themselves are of No. 0 equivalent-stranded aluminum. Two miles of the main circuit pass through the suburbs of Atlanta, running along the curb line of the street, and here, of course, it became necessary to occupy less ground area and thereby to reduce the tower to what is really a carefully designed square latticed pole, which carries the conductors in precisely the same way as the other towers but on a slightly shorter span, some 425 ft. on the average.

Another interesting part of the system is a large switching tower near the Hampton substation. This is a latticed steel structure supporting in the free open air the group of long switches for sectionalizing and interconnecting the lines at this particular point. In some of the Pacific Coast plants the open-air switching system has been used very successfully, and not uncommonly it forms an addition to power houses and substations, but its use in Eastern plants has been somewhat limited, so that this Southern example is rather a striking one.

The main substation at Atlanta is of about 9000-kw rating, and is equipped with a complete feeder system with duplicate low-tension buses supplying energy to feeders at 11,000 volts. The whole system is worked by electrically operated switches from a switchboard on the main floor of the substation, the current for the purpose being derived from a storage battery charged by means of a rectifier from the alternating-current circuits. Each of the other two substations is of 900-kw rating, the one in Monticello being supplied with energy from one pole line carrying a single 66,000-volt circuit. Altogether the system is a capital example of recent tendencies in both line construction and operation.

Joint Recommendations of A. S. M. E. and A. I. E. E. Committees

The recent announcement of certain recommendations of joint committees from the American Society of Mechanical Engineers and the American Institute of Electrical Engineers is interesting not only for the significance of a joint society action but also for the significance of the recommendations themselves. It is noteworthy that this is the first piece of joint standards committee work undertaken, so far as we have information, between sister engineering societies in the United States, and why we should have had to wait so long for it is hard to perceive. The mechanical and electrical engineers have much in common. It would seem that in the future they will have much more in common. In fact, it would seem that twenty years hence there will be no line of demarcation left between an electrical and a mechanical engineer, except in regard to the specialty he may happen to be engaged in. Mechanical engineers will be so surrounded with electrical apparatus, and electrical engineers so surrounded with mechanical apparatus, that their experience will necessarily merge.

It is to be hoped that in the broad interests of engineering there may be a continuance of the joint action and co-operation of standards committees of the two societies concerned. Indeed, it is desirable that the movement should go further. The four great national engineering societies are the civil, the mechanical, the electrical and the mining, not to mention more recent societies in collateral branches. So closely are the technical interests of these groups interwoven that there should manifestly be standards committees permanently appointed by each for itself, with the understanding that joint sessions of two or more of these shall be convened by mutual direct invitation whenever desirable. In this way, each society's standards committee might meet independently, say, once a month, but they might meet conjointly, say, twice a year. The joint actions would, of course, be subject to the approval of the respective governing boards. This simple arrangement would not only serve to cement harmonious co-operation but also would facilitate much needed standardization in overlapping fields.

In regard to the recommendations themselves it is good to see how simple they are and how much complexity they would eliminate if adopted. As long as electric generators were constructed either belt-driven or on separate bearings their efficiency could be determined independently of that of their prime movers. Even when the generator was

directly connected and not mounted on separate bearings, but so as to be capable of independent operation, the same procedure could be followed with some stretch of imagination, but when the prime mover and the generator are incorporated into a single structure so closely as they are to-day in turbo-generator steam units it becomes necessary to test them as single machines taking in power in steam and giving it out in electricity. It then becomes a mirth-provoking spectacle to find the engineers testing the machine by measuring the power input in boiler-horse-power or in thermal units per hour and the power output in watts or kilowatts. Clearly, the power should be measured in one and the same unit at both input and output. While it would be perfectly feasible to measure and state the power output in terms of heat, to match the input custom, yet the process would be cumbersome and unsatisfactory.

On the other hand, the watt is a unit of power of any type—thermal, mechanical, chemical or electric—and it is a simple matter to express the thermal input in watts or myriawatts. As Mr. H. G. Stott pointed out in his paper last year, it happens that the boiler-horse-power is so nearly equal to the myriawatt, or ten kilowatts, that the difference in likely to appear only in careful measurements. The mechanical engineer can surely find no objection to the name of James Watt as a unit, and the prefix "myria" belongs to the established international system of units, as, for instance, in the myriammeter. In fact, the English word "myriad" has two meanings, namely, a very large number and ten thousand. We hope, therefore, that the proposals of the joint committees will find favor and adoption among engineers generally, whether mechanical or electrical, and that the watt, in any of its decimal multiples, will come into general use for power measurements.

Peat as a Source of Electrical Energy

As our readers are well aware, within the last few years many experiments have been made, both here and abroad, with peat used as a practical fuel. Most of the work has been profitless so far as this country is concerned, but reports from various parts of the European Continent have shown occasional successes notable enough to be somewhat encouraging. One of our foreign contemporaries has been publishing of late an important series of papers, abstracted in our *Digest*, concerning the practical application of peat as fuel. As is well known, peat is, so to speak, the product of a very early stage of coal development, the beginning of the systematic carbonization of vegetable material which under possibly different conditions might in time result in coal. So far as the composition goes, peat may be regarded as having a crude resemblance to lignite. The latter carries less moisture, less volatile matter and more fixed carbon, peat running to something like 50 per cent volatile matter and 20 to 25 per cent fixed carbon with about an equal percentage of moisture when thoroughly dried. However, peat is very widely distributed and not at all bad fuel under favorable circumstances, to wit, when it can be dug cheaply and used on the spot. It is essentially a fuel of the moors and bogs, carrying at least 50 per cent of moisture, and generally much more when dug, and requiring to be freed from most of this by artificial drying or exposure to air.

The German experiments referred to have been carried out on a comparatively large scale in the East Friesland district under government supervision, and have resulted in the operation of a transmission plant of considerable output distributing energy over a network of wide extent and serving an extremely useful purpose quite aside from the demonstrational importance of its use of peat as a fuel. The district is very rich in peat, the deposits being of rather good quality. In fact, even at a large increase over the present demand for energy in the territory reached there is certainly a supply of peat sufficient to last for centuries. The plant now in use is of about 4000-kw rating in three turbo-generators fed by four water-tube boilers with super-heaters, and the general distribution is at 20,000 volts. The peat is cut by motor-driven machinery and handled in a thoroughly businesslike way. Under such circumstances peat, despite a rather low thermal value, becomes a thoroughly practicable fuel. Depending on air drying implies that the consumption on a weight basis would vary more or less with the weather, but it is found on the average that from 2.5 kilograms to 3 kilograms of peat per kilowatt-hour is about the usual consumption. It is a question whether direct consumption of peat is as advantageous as its use for making producer gas, a procedure which its large percentage of volatile matter would naturally suggest. In fact, some further German experiments, referred to in the papers under consideration, indicate that by resorting to gas production the consumption of peat per kilowatt-hour can possibly be brought down to less than 1.5 kilograms, certainly to 2 kilograms, per kilowatt-hour, the results being materially better than in direct combustion.

The calorific value of peat is, of course, low, hardly more than 6000 or 8000 heat units per pound, even when pretty thoroughly dried, and, of course, proportionately less when wet. Nevertheless, at the consumption here stated, peat is a cheap fuel when it can be cheaply obtained. The price being taken at $1.25 per metric ton, the cost of fuel per kilowatt-hour is less than a third of a cent, even when used on a comparatively small scale, as in the plant cited. Certainly fuel having half the calorific value of high-grade steam coal must be regarded as cheap at $1.. per ton, even though it be more difficult and troublesome to u. under the boilers than coal. The German experiments are well worth investigation by the engineer. The salient facts disclosed are those which have become evident in previous investigations, showing that the whole question of economy in the use of peat turns on the ability to get a cheap supply locally. Mining with machines on a large scale and in a fairly homogeneous deposit enables this to be done. The next serious question is drying the peat to a point where it can be advantageously utilized. When the sun-dried product can be used, a condition existing only under favorable circumstances, a very useful and low-priced fuel is at hand. If an attempt be made to free the peat from moisture on a scale large enough to permit its transportation as fuel, the general result has been and is likely to be failure. Only in a few fortunate regions where peat and labor are cheap and the market near can peat be used successfully outside its own locality. But as a local fuel for use in energy-distribution works in a region of plentiful supply and cheap labor it has much to recommend it.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

New York Legislative Committee Opposed to State Hydroelectric Scheme

In the Jan. 4 number of the *Electrical World* there was published an extensive account of the plans of the New York State Conservation Commission, which proposed a state-wide scheme of hydroelectric development and high-tension transmission under state ownership and operation similar to that which now obtains in the Province of Ontario, Canada. The joint legislative committee named to investigate the state's water-power resources has just submitted its report, recommending a plan for conservation and utilization diametrically opposite to that of the conservation commission. The committee declared that it would be impossible for the State of New York to develop a sufficient amount of hydraulic power to make any appreciable impression on the power demands of the State. It investigated the plan of the Hydro-Electric Power Commission of Ontario and reports that, in its opinion, measured by economic and business standards, the plan is not a success. Accordingly the committee opposes the adoption of a similar plan by the State. The committee points out that there is within the State a daily hydraulic consumption of over 2,000,000 hp and that to deliver this to the point of utilization would require over 8,000,000 hp at the penstock. It finds that there is undeveloped within the State only 1,196,800 hp, 262,700 hp of which is actually owned by the State, the rest being claimed by private owners. The committee declares, regarding the Hydro-Electric Power Commission of Ontario, that it has never developed any water-power but has acted merely in the capacity of middleman in the merchandising of electrical energy; that it furnishes electricity to the municipalities below cost; that if the same methods were applied as are employed in business transactions of a similar nature there would be an annual loss of at least $432,170, and that in addition to this loss to the Province the local distribution systems of the municipalities would also show a loss. It is claimed that the municipal system of Toronto showed a net loss to June 30, 1912, of $268,984.

Railroad Commission of California Plans Elaborate Induction Tests

As the result of complaints of inductive interference by high-tension transmission lines, presented to the Railroad Commission of the State of California by telephone companies, the commission has authorized the organization of a joint committee made up of representatives of the various utilities involved and of the Railroad Commission. This committee has just undertaken a series of tests to throw new light on the subject of induction. The representatives of the telephone and telegraph interests on the committee are Messrs. A. H. Griswold, R. W. Gray, C. H. Temple and L. M. Ellis. The transmission companies are represented by Messrs. H. A. Barre, Louis Elliott, P. M. Downing and J. E. Woodbridge; representing the railroad interests is Mr. A. H. Babcock, and the representatives of the State Railroad Commission are Messrs. R. A. Thompson, A. R. Kelly, L. E. Hoar and J. T. Shaw.

The program of tests to be carried out is quite elaborate. There will be complete electrical tests on various types of telephone circuits to determine their electrical and physical conditions when not subjected to transmission-line interference, as well as complete tests on various types of transmission systems, without power on the system, to determine their electrical and physical characteristics. Combination tests for various types of telephone and transmission systems under normal and abnormal operating conditions of both systems will also be made.

These will embrace complete electrical tests of various types of telephone circuits under normal operation of the transmission systems; of star-connected, grounded-neutral, and of delta-connected transmission systems; of single-phase and of direct-current railroad systems; of telephone and star-connected, grounded-neutral, and of delta-connected transmission systems operating under conditions other than normal, and of telephone and single-phase and of direct-current railroad systems.

Electrical Farming Near Dayton, Ohio

Some of the possibilities of electric-soil stimulation as a central-station off-peak load were pointed out in a talk before the New York Companies' Section, N. E. L. A., Jan. 20, by Mr. F. M. Tait, president and general manager of the Dayton (Ohio) Lighting Company, which is carrying on comparative experiments in the introduction of nitrogen into the soil by electric discharges.

"I have learned to be an optimist in anything electrical," said President Tait. If the effectiveness of electrical stimulation of plant growth can be demonstrated, he went on to show how a vast agricultural off-peak load might be developed for the central station's machines during the idle hours from, say, 10 p. m. to 5 a. m. In the evening after the city demand is passed, the output of the power plant could be turned into the country, replenishing the soil and deflecting to the central station's advantage the outlay now made for the tons of fertilizer which the farmers buy. Crops might then be raised independently of even rainfall, for motor-driven irrigating pumps would supply all necessary moisture.

Unable to satisfy itself of either the value or the deficiency of electric-discharge methods of plant stimulation from information obtainable from outside sources, Mr. Tait's company is undertaking its own experiments at a farm 6 miles from Dayton, supplied with central-station service. Duplicate flower boxes have been fitted up in a greenhouse so as to obtain identical conditions of sunlight, moisture, heat, etc., except that one set of plants will be electrified, while the other will be subject only to ordinary conditions.

Besides the usual equipment of motor-driven farm machinery, barn and residence lighting, etc., these electrified farms near Dayton enjoy outdoor lighting from tall steel poles carrying 500-watt tungsten lamps 75 ft. above the ground. The resulting illumination is most effective for driving or finding one's way about the farm grounds at night. The steel poles are also equipped with cords and sheaves, so that they may be used as flagstaffs during the daytime.

Electrical construction on the farm has its own special problems and difficulties, sometimes ludicrous as well as serious, according to Mr. Tait. While one of the metal

flagpoles was being raised it got beyond the control of the men and fell with one end in contact with the 6600-volt transmission circuit and the other across a barb-wire fence. Instantly the fences for miles around became charged and every fence post began to smoke. It was only by quick work that the cross was cleared before injury had been done to persons or animals attracted by the curious phenomenon of a wire fence undergoing spontaneous combustion. On another occasion a line gang was painting poles the dark-green color which has been adopted to make them less conspicuous against the countryside. The painters failed to notice that a herd of steers was in the field. After the men had gone the cattle went up to inspect their work, licked all the paint off the poles within 4 ft. of the ground, and in fifteen minutes three of the animals lay dead from poisoning. These steers cost the electric company $150 apiece, and it failed even to get redress from the paint manufacturer under the pure-food law.

Edison Electric Safety Lamp

In accordance with announcements previously made in these columns, the American Museum of Safety, New York City, awarded the Rathenau gold medal to Thomas A. Edison on Jan. 23 for his electric safety lamp. The lamp, which is said to represent the culmination of several years' work on the part of Edison, is shown herewith. Its make-up is simple and rugged and as fool-proof as possible. Two nickel-iron cells are used, the positive of one and the negative of the other being grounded to the can and the two cells connected together and placed in a nickeled-steel case. Spring terminal contacts on the battery connect with nickeled-steel contact plates affixed to, but insulated from, the top of the case. No insulation is provided between the two

FIG. 1—SAFETY LAMP ATTACHED TO MINER

cells or between the cells and the case. When the hinged top on the latter is brought down and fastened by means of a hasp to the staple, the battery is secured and the case may be locked.

The twin-conductor flexible cord is provided at one end with a terminal, which when shoved into the socket on top of the battery case becomes fastened in such a manner as to preclude the possibility of disconnecting it without unlocking the case and withdrawing the lock bar from articulation with the eye on the terminal. It is therefore impossible for a miner to cause a spark by disconnecting a wire in a mine. For a portion of its length at both ends the twin conductor is incased in flexible steel which serves as an anchor and prevents sharp bending of the conductors.

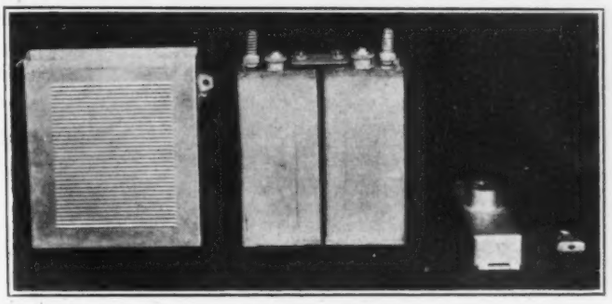

FIG. 2—STORAGE BATTERY AND CASE

The cap outfit comprises a parabolic reflector provided with a flange supporting a thick glass lens cushioned on gaskets, a small tungsten lamp, a socket for supporting the lamp and reflector, and a hook to fit into the miner's regulation cap. It is impossible for the miner to tamper with the lamp without disrupting a severable mechanical seal on the flange of the reflector. To provide mechanical strength a thick lens of proper optical conformation is employed.

In Fig. 1 the battery case is shown attached to the back of a miner. It will be noted that the conductors lead upward through a guide in the miner's cap and pass over to the lamp, which is attached to a leather support on the front of the cap. The case is shown locked, as in practice the intent of the inventor is that the outfit shall be given to the miner by the electrician fully charged and in service. The battery complete weighs about 2 lb. and is a trifle over 5 in. wide and 4.5 in. high. The battery has an emf of 2.4 volts, and it will give 4 amp-hr. The tungsten lamp is rated at 2 cp.

A. I. E. E. Affairs

At the January meeting of the board of directors of the American Institute of Electrical Engineers indorsement was given to the recommendation of the standards committee of the Institute and a special committee of the American Society of Mechanical Engineers that the term "myriawatt" be applied to the quantity formerly known as the "boiler-horse-power," the use of the latter term being discontinued.

Past-president Charles F. Scott was appointed first vice-president on the executive committee on organization of the International Electrical Congress, to fill the vacancy caused by the resignation of Mr. W. D. Weaver.

Chairman Rugg of the meetings and papers committee announced that arrangements had been made for a series of four lectures to be delivered before the Institute by Prof. E. P. Adams, of the Palmer Physical Laboratory, Princeton University, on Tuesday evening of each of the last two weeks in March and the first two weeks in April, under the auspices of the electrophysics committee. The board voted to extend an invitation to attend the lecture to the members of allied engineering societies through their respective secretaries.

The secretary was instructed to communicate with the secretaries of other engineering societies, inviting their members to attend the sessions of the midwinter convention and to take part in the discussions. The board voted to omit the February New York meeting in order that the committee might devote itself to the midwinter meeting.

A communication was read from Prof. W. F. Durand, chairman of the conference committee on the International Engineering Congress, San Francisco, 1915, stating that the local committee of the congress was being organized and that it was desirable for the Institute to appoint its representatives on the committee at the earliest possible date. The president was authorized to appoint three representatives on the local committee.

Peoria Electrical Show

The second annual Peoria Electrical Show was opened in the Coliseum in that city on Jan. 18. It presented an attractive appearance, and, judging by the interest taken by press and public, the attendance promised to be good. One side of the large central space was occupied by a stage, and here were given musical, vaudeville and other performances, including a high-potential "fireworks" exhibition and lecture.

The Peoria Gas & Electric Company made an exhibit of lighting and electric-cooking apparatus. The "show" feature in this space was a tungsten lamp suspended pendulumwise from a swinging strip of glass and illuminated without any visible source of electricity, although there was a near-by induction coil (or what looked like one), with ostentatious copper-wire terminals extending near similar wires projecting from the lamp socket. A close observer, however, might have noticed tiny strips of tinfoil on the narrow edges of the glass pendulum, and these formed the path of the current to the 110-volt lamp.

The Illinois Traction System displayed, in operation, electrically controlled block signals. Several creditable pieces of "wireless" and other apparatus made by the pupils of the Manual Training High School of Peoria and other schools attracted attention. As noted elsewhere in this issue, a number of manufacturers exhibited their products in attractively decorated booths.

Mr. Leroy A. Mills was the manager of the show, which was announced to be closed on Jan. 25.

Testimonial Banquet to Mr. W. H. Blood, Jr.

About 150 men prominent in the central station and the electric vehicle industries tendered a testimonial banquet to Mr. W. H. Blood, Jr., past-president of the Electric Vehicle Association of America, on Jan. 16, at Delmonico's, New York City. After the dinner started general jollification set in, and while the various courses were being served an orchestra and male quartet rendered popular selections, the hosts joining in the choruses, which were provided in printed form. Mr. R. M. Searle, vice-president of the Rochester (N. Y.) Railway & Light Company, joined later by Mr. Charles Blizard of the Electric Storage Battery Company, started the general jollification by playing the bones, and Mr. Thomas Murray, vice-president and general manager of the New York Edison Company, favored the diners with several tenor solos which were heartily enjoyed and applauded. Mr. Arthur Williams, who is Mr. Blood's successor as president of the Electric Vehicle Association of America, acted as toastmaster, and after reading congratulatory messages from Messrs. Louis Ferguson, Chicago; C. E. Michel, St. Louis; G. H. Harries, Chicago; Guy Tripp, New York; R. F. Pack, Minneapolis; O. B. Young, C. A. Stone and E. S. Webster, Boston, quarter-minute speeches were made by Messrs. C. L. Edgar of Boston, J. F. Gilchrist of Chicago and F. M. Tait of Dayton. Mr. Blood, responding to the toast proposed by Mr. Williams, in which the latter referred to the splendid efforts of the guest of the evening in behalf of the association, expressed his appreciation of the honor thrust upon him and graciously named various members of the association to whom credit was due for much of the work thus far performed. After the speeches were over professional entertainers made merriment till almost midnight.

New York Auto Truck Show

There was an aspect about the aisles of Madison Square Garden and the New Grand Central Palace, New York, this week decidedly different from that of last week, when pleasure cars rather than motor trucks and delivery wagons were on exhibition. The attendance, although far less dense, was of a different character. Most of those who attended had transportation problems of their own which they hoped could be solved by the motor vehicle. The majority of the exhibitors were manufacturers of gasoline cars, but there was a fair representation of electric vehicles. The exhibits of the latter, eight in number, were grouped at the New Grand Central Palace, and the newest feature in the construction of the models shown was a worm and gear drive. In this drive the armature of a single motor is directly connected to a worm gear, which operates the differential gearing through a short shaft. There was a large array of ignition and electric starting systems on exhibition at Madison Square Garden, there being a very decided leaning toward electric starting in both pleasure and commercial gasoline vehicles this year.

Mr. Arthur Williams on the Electric Vehicle

Because of the scarcity of exhibits of electric vehicles at the two large automobile shows held in New York for the past two weeks the inference has been drawn in many quarters that the use of the electric vehicle is on the wane and that its gasoline competitors are increasing in popularity. The manufacturers of electric vehicles, however, have drawn attention to the fact that it was impossible for them to obtain good exhibition spaces at either show regardless of the expense involved, and rather than have their machines placed in out-of-the-way corners or galleries many decided not to exhibit at all.

That the popularity of the electric vehicle is increasing rather than on the wane was brought out by Mr. Arthur Williams, president of the Electric Vehicle Association of America, in an address before a joint meeting of the New England Section and of the Electric Motor Car Club of Boston on Jan. 10, an abstract of which address was published in the *Electrical World* of Jan. 18. Mr. Williams, as is well known, is a past-president of the National Electric Light Association and president of the Association of Edison Illuminating Companies and numerous other national bodies, besides the Electric Vehicle Association of America. The New York Edison Company, with which Mr. Williams is associated, has been a consistent user of electric vehicles for years, and Mr. Williams has given much thought to the vehicle and to its possibilities. Asked to supplement his Boston address on the development of the electric vehicle, Mr. Williams made the following statement to a representative of the *Electrical World:*

Rapid Growth of Electric-Vehicle Industry

"One of the 'signs of the times' is found in the rapid growth of the electric-vehicle industry for business and commerce. For both purposes these vehicles are seen in increasing numbers on the streets of our cities. This is due partly to the improvement in the vehicles themselves and partly to the growing appreciation of the public of the advantage of this method of power movement, contrasted with any other now available.

"Other things being equal, the service that is most attractive, simple, adequate, convenient and economical will survive and prevail. That has been true of the candle over the pine knot, of the oil lamp over the candle, and of gas

and electricity over oil. It is true of animal over human power, of mechanical over animal power, and now of the electric motor over the reciprocating engine. In pleasure cars those who appreciate convenience, simplicity and economy will use the electric automobile; in business those who demand the most reliable and the cheapest service will use the electric vehicle. It is the survival of the fittest.

"It would be unfair and foolish to deprive the gasoline engine of the enormous credit it deserves in the development of the modern automobile. Each successive stage in human development has been of incalculable value to the people of the time. We readily imagine the luxury of the candle, then of the lamp, of ever-increasing brilliancy, and then of gas, which to-day is still a most attractive illuminant, and now the electric light. What a relief was the use of animal power for that formerly furnished by human beings! Then came the revolution to all industry by the utilization of steam in the reciprocating engine. So with the gasoline pleasure or commercial car—it has its place. But, step by step, year by year, our minds will reach the conclusion that the field of the gasoline car is limited and that the great part of pleasure riding and commercial haulage will be accomplished with the portable storage battery and the electric motor.

SPIRIT OF CO-OPERATION MANIFESTED

"A new spirit is growing in this industry. It is exemplified through the Electric Vehicle Association of America. It is a spirit of co-operation between the central stations and the manufacturers of vehicles, motors, batteries and accessories, and between their representatives and the public.

"There is a common purpose to improve designs and materials, to standardize parts, to increase facilities, and in the interest of the electric vehicle to work unitedly for the common good. This is contrasted with the older spirit when each manufacturer thought his interests were conserved by depreciating as far as he could the product of his competitor, with the result that the prospective purchaser became so discouraged in going from manufacturer to manufacturer or from agent to agent that he gladly welcomed the competent and sometimes almost inspired representative of the gasoline motor car.

STANDING OF MEN BEHIND THE MOVEMENT

"A crowd as well as an individual makes an impression upon the observer and, like the individual, has a personality. It was a wonderful aggregate of personality, suggesting the highest degree of skill in manufacture, in selling, in administration and executive efficiency, that gathered in Boston in the central-station and electric-automobile interests a few nights ago. And one could not do other than feel privileged to belong to an industry such as that represented by the electric-vehicle and central-station men who met in New York as hosts at the testimonial dinner to Mr. W. H. Blood, Jr., on Thursday evening, Jan. 16. If men of character, personality and ideals, united in a common cause, mean anything at all, these men in their collective as well as individual personality mean a great future for the electric vehicle, whatever the purpose of its use."

Electric-Vehicle Insurance Rates Lowered

During the past two years the insurance committee of the Electric Vehicle Association of America, of which Mr. Day Baker, Boston, is chairman, has endeavored to secure a preferential rate on pleasure and commercial automobiles operated by electricity. Less than a year ago the committee announced a reduction of a 10 per cent preferential rate, and on Jan. 6 the New England Casualty Company, of Boston, announced a preferential rate for electric vehicles which is approximately 20 per cent lower than the rates charged for gasoline cars.

Electric-Vehicle Growth at Boston

At a recent meeting of the Electric Motor Car Club of Boston President Day Baker exhibited an interesting curve sheet from which the accompanying table has been drawn up, showing the development of commercial electric-vehicle applications in the Boston district, traced from the beginning of battery-driven truck and delivery-wagon service to the present. From 1902, when the first two machines were put in commission in Boston, little was accomplished until 1908, when determined efforts were undertaken to stimulate interest in the field by various battery and accessory interests, together with one or two prominent electric-truck manufacturers. During the past three years a rapid gain has been made in the electric-vehicle field at Boston, and the increase in the rate of application following the beginning of the Boston Edison campaign in 1911 is clearly shown. At the present writing more than 300 commercial electric vehicles are either in service or on order at Boston.

ELECTRIC-COMMERCIAL-VEHICLE GROWTH AT BOSTON

Year	New Cars	Total	Year	New Cars	Total
1902	2	2	1908	13	34
1903	5	7	1909	28	62
1904	2	9	1910	57	119
1905	1	10	1911	74	193
1906	7	17	1912	86	279
1907	4	21			

Importance of Electric Truck as Central-Station Load

In a paper presented before the regular monthly meeting of the Electric Vehicle Association of America in New York on Jan. 21, Mr. H. W. Hillman, of the General Vehicle Company, discussed the relative importance to the central station of the load supplied by the electric truck as compared with that of other classes of apparatus. By means of a census of thirty central stations situated in cities ranging in population from 1,000,000 down to 25,000 inhabitants, the author of the paper compiled a table on the basis of the relative annual income per kilowatt of the necessary plant equipment. In this list are included small and large residences, small retail stores, churches, industrial motor installations of one, two, three, eight and twenty motors, drugstores, saloons and one 2-ton motor truck. It is interesting to note that the revenue derived from the 2-ton electric truck is second only to that of the saloon and the drugstore.

In comparing the truck with the electric flatiron as an energy consumer, it was stated that while it would take eighty-six irons to equal the annual income from one 2-ton truck, the iron would represent a connected load of 51.6 kw, while the truck would call for only 6 kw. Thus for the same plant equipment the electric truck has eight and one-half times the earning capacity of the electric flatiron.

When compared with the industrial motor load, the author stated that an electric-truck battery is connected on the line from six to eight hours every night, while industrial motor installations are frequently on the line less than three hours each day. From a compilation of figures presented it was shown that the load-factor of an electric truck is 35 per cent and for the average industrial motor installation it is only 10 per cent.

During the discussion of the paper the meeting was addressed by Messrs. Joseph Becker, of the United Electric Light & Power Company; M. S. Seelman and D. F. Tobias.

of the Brooklyn Edison Company; C. V. Marsh, of the Bates Advertising Company; E. W. Curtis, of the General Vehicle Company; C. W. Price, of the *Electrical Review;* H. H. Rice, of the Waverley Company; S. G. Thompson and T. F. Bloodworth, Jr., of the Public Service Electric Company; Harvey Robinson, of the New York Edison Company; J. Johnson, of the Yonkers Electric Light & Power Company; R. L. Lloyd, of the Philadelphia Electric Company, and H. F. Thompson, research associate of the Massachusetts Institute of Technology.

Mr. Hillman, in closing the discussion, appealed to the central-station managers for closer co-operation with the electric-vehicle salesmen. He stated that in order to bring to the front this branch of the central-station business, which is presenting a high annual income, good load-factor and off-peak demand, co-operation is necessary, and that the advantage to be gained by both parties is certainly very evident.

Northwestern Cedarmen at Duluth

The seventeenth annual meeting of the Northwestern Cedarmen's Association was held in Duluth, Minn., on Jan. 7 and 8. Mr. T. P. Bradley, of Duluth, the president, occupied the chair. In his annual address he commented on the organization of the Cedarmen's Exchange for Interinsurance and also referred to an order of the Interstate Commerce Commission in the matter of the investigation of alleged irregularities and discrepancies in the weighing of freight by carriers. Mr. Bradley contended that the carriers do not give proper consideration to claims for overweight. He said that the members of the association are paying out hundreds of thousands of dollars every year in payment of freight charges, and as long as the railroads refuse to recognize any weights other than those of their track scales, the association and its members should leave nothing undone to secure accurate weighing. The railroads make an allowance of only 500 lb. a car for stakes and supports in the equipment of open cars. The average weight of stakes actually used in loading a car of poles is about 1200 lb. This means that the shipper is required to pay freight on the remaining 700 lb. The speaker hoped that the time is not far distant when the railroads will be required to furnish open cars properly equipped for the loading of poles or else make a provision in their tariffs giving an allowance of 1200 lb. to the pole shipper. Mr. Bradley said that the pole business had shown some improvement in the year 1912. At the present time stocks are broken, with a marked shortage in some sizes.

Secretary H. H. McKinney, of Minneapolis, in his annual report said it was probable that about the same amount of stock would be put in this season as a year ago. The association had twenty-two calls for inspection during 1912, thirteen of which were for poles. Mr. McKinney suggested that steps be taken at the present session of the Legislature of Minnesota to secure the enactment of a law giving the State Railroad and Warehouse Commission the same authority over the weighing of lumber and forest products as it has now over grain, hay and coal. The Northwestern Cedarmen's Association now consists of thirty-two members, the new members admitted in 1912 being the Curry & Whyte Company, of Duluth; the I. Stephenson Company, of Wells, Mich.; the Clark Pole & Tie Company, of Bemidji, Minn.; Finch Brothers, of Superior, Wis., and the Learned Cedar Company, of Minneapolis.

At the afternoon session of Jan. 7 Mr. Robert H. Ross, manager of the Cedarmen's Exchange, outlined the work being done by that organization. Mr. E. L. Clark, chairman of the insurance committee, offered a resolution, which was adopted, to the effect that it is the duty of the members of the association to use the insurance of the Cedarmen's Exchange as much as possible.

The Wednesday morning session was given over to a discussion of the proposed changing of the name of the association from the Northwestern Cedarmen's Association to the Northern White Cedar Association. On motion of Mr. Clark a special committee of three will be appointed to report on this subject at the next annual meeting. Another special committee will consider changes in the constitution in reference to time of meetings.

Officers for 1913 were elected as follows: President, Mr. W. C. Moss, Minneapolis; vice-president, Mr. J. W. Benham, Chicago; treasurer, Mr. W. B. Thomas, Manistique, Mich.; secretary, Mr. H. H. McKinney, Minneapolis; directors, Messrs. E. L. Clark, Minneapolis; H. W. Reade, Escanaba, Mich.; M. K. Bissell, Escanaba, Mich., and L. A. Page, Jr., Minneapolis. The annual banquet was held on the evening of the first day and was greatly enjoyed.

Western Red Cedar Association

At the annual meeting of the Idaho Cedarmen's Association, held Jan. 14 at Spokane, Wash., the name of the organization was changed to that of the Western Red Cedar Association to include the larger geographical distribution of the present membership, practically all of which was represented at the meeting. A feature of the session was the report received from Mr. J. B. Knapp, United States assistant district forester, Portland, Ore., covering comparison tests of Michigan white-cedar and Idaho red-cedar poles, 25 ft. in length, with 7-in. tops. The Idaho poles examined were declared very much superior by the forester, the Eastern poles containing varying amounts of center rot and a good many knots. For comparisons of strength, obtained with a 200,000-lb. Olsen testing machine, he submitted these figures, based on allowances for equal pole diameters: Modulus of rupture, pounds per square inch, Michigan white cedar, 3400; Idaho red cedar, 6670. Breaking load, pounds per square inch, Michigan white cedar, 8450; Idaho red cedar, 18,510.

The following officers were unanimously elected for the ensuing year: President, Mr. H. C. Culver, Sandpoint, Iowa; vice-president, Mr. M. P. Flannery, Spokane, Wash., and secretary-treasurer, Mr. R. L. Bayne, Spokane, Wash. Messrs. W. M. Leavitt and E. A. Lindsley, with the president as member ex officio, were appointed as a committee to draft a constitution and by-laws for the association, the dues of which have been raised to $25 a year.

Contractors on Cost-Keeping and Co-operation

At the midwinter convention of the Illinois Electrical Contractors' Association, held in Peoria on Jan. 17 and 18, there were two open sessions. At the first one Mayor Woodruff of Peoria gave an address of welcome, and there were speeches by Mr. Ernest Freeman, president of the National Electrical Contractors' Association, and a number of others.

About sixty-five contractors attended the convention, at which Mr. William McGuineas, of Chicago, presided. The principal feature of the afternoon session of Jan. 17 was an illustrated address by Mr. Frank L. Decker, of Chicago, on "Bookkeeping for Electrical Contractors." In introducing Mr. Decker Mr. McGuineas remarked that the former was the working member of the committee on education appointed at the last convention. There is a great need, the president said, for educational effort among electrical contractors, to the end that they may learn to analyze their work according to modern methods.

Mr. Decker remarked that electrical contractors need training as much as men in any other class of business. The contractors should learn how to do business, and particularly they should understand modern methods of cost-

keeping. In this educational work the benefits of association are very apparent. After this preamble, the speaker traced an assumed job of electrical construction and gave lantern-slide pictures of the different tickets and bookkeeping sheets needed to make a complete and scientific record of it. Beginning with the sales-order ticket, he followed with the job-cost sheet, the charge ticket, the credit ticket and the loose-leaf ledger sheet where the account is entered. The recapitulation sheet was also illustrated by the speaker.

In the particular case under discussion, Mr. Decker assumed a flat overhead expense of 20 per cent of the cost of the job. The total cost is that of the merchandise used added to the labor and the overhead expense. The difference between the total cost thus ascertained and the price obtained is the profit, of course.

The bookkeeping sheets illustrated by Mr. Decker included a record of cash received, the bank statement, the record of checks drawn, journal entries (entries relating to other than cash transactions), record of invoices payable, distribution sheets of various descriptions, accounts payable, record of checks drawn, loss-and-gain statement (monthly) and the payroll (weekly).

In the discussion of Mr. Decker's paper Mr. W. P. Ball of Moline, explained his system of bookkeeping for contractors. Mr. Alexander Knauber, of Chicago, praised the Decker system as a simple one and remarked that if the electrical contractor will ascertain his real costs he will remove the greatest stumbling-block in the electrical contracting business.

Mr. J. T. Marron, of Rock Island, also commended the Decker system, which, he says, is intended for the great army of small electrical contractors who have no system at all, and not for the few who have modern methods of bookkeeping in use. He added that the National Electrical Contractors' Association might indorse the Decker system.

Mr. T. D. Buckwell, of the Peoria Gas & Electric Company, was introduced and spoke of the relations of the electric-service company and the contractors in Peoria. He told of the "electrical page" in Peoria newspapers and also of the company's individual plan of advertising. The Peoria company does not do any inside wiring, leaving that for the contractor. It sells signs, but is glad to have others sell them also. In relation to the sale of appliances it does not cut prices, and so far as lamps are concerned, it gives no free renewals of any kind. In general, the Peoria company is anxious to co-operate with the contractors. Electric-service companies spend much time and money in endeavoring to ascertain their own costs, and Mr. Buckwell remarked that he was glad to see that the contractors are doing likewise.

Mr. F. E. Bolte, of East St. Louis, as a contractor, spoke in laudatory terms of the amicable relations in Peoria. He said the central-station companies should appreciate the importance of workmanlike wiring in connections made with their systems.

As an indication of the appreciation of the work which has been done on the bookkeeping system, the officers of the association, through Mr. McGuineas, handed Mr. Decker a check for $50.

"Reflectors and Their Use" was the title of an illustrated address given by Mr. J. M. La Belle, of Bloomington, representing the National X-Ray Reflector Company of Chicago. The speaker illustrated a large number of fixtures and installations, both for indirect and direct illumination. He remarked that hospitals furnish a particularly favorable field for the use of indirect illumination. Newer fixtures illustrated are the illuminated-bowl indirect-lighting fixture and the new indirect-lighting table and piano lamps.

There was a brief discussion following this paper, and Mr. J. N. Pierce, of Chicago, said that the contractor who is not informed on illumination is out of date.

Wisconsin Electrical Association

All told, the attendance at the fifth annual meeting of the Wisconsin Electrical Association, held in Milwaukee on Jan. 15 and 16, was about 160. Several subjects of importance were discussed, and there were a number of exhibits, including a display made by the Railroad Commission of Wisconsin. Mr. Irving P. Lord, of Waupaca, president of the association, occupied the chair, and Mr. George Allison, of Milwaukee, as secretary-treasurer, reported fifty-six active and fifty associate members on Jan. 1, 1913, the treasury balance on that date being $1,197.48.

In a brief address President Lord said that the year 1912 had been a fairly prosperous one for the electric-service companies of Wisconsin. The Railroad Commission has done much in raising standards of service among the smaller stations. The speaker expressed his belief that, in general, the Legislature wants to do what is right by the utilities. The lawmakers need accurate information from operating men, and the Wisconsin Electrical Association should furnish much of this information. All members should assist the association's committee on legislation.

The Question of Taxation

Mr. T. A. Pamperin, of Oconto, a member of the committee on taxation, said that a bill for the purpose of regulating taxation in Wisconsin was in preparation. The new income-tax law has raised many questions, and, among others, that whether the corporations should pay the income tax on their bond interest and stock dividends. Mr. Clement C. Smith, of Milwaukee, pointed out that the income tax of corporations was levied not on physical value but on net earnings without deducting depreciation. He thinks that if the Tax Commission increases taxes the Railroad Commission should permit higher rates for service. The Tax Commission means to be fair, he said, but the trouble is that the burden of taxation is not distributed equitably. Much interest was manifested in this question and Messrs. George B. Wheeler, of Eau Claire; W. H. Winslow, of Superior; P. H. Korst, of Janesville, and others took part in the discussion.

Maintenance of Arc Lamps

Mr. L. H. Lathrop, of Marinette, read a paper on "Proper Operation and Maintenance of Arc Lamps." He mentioned the fact that rectifier tubes used with metallic-flame systems may be given longer life by immersion for several hours in a bath of boiling water. The importance of employing competent arc-lamp repair men and of their making daily reports was emphasized. Co-operation with policemen in reporting outages should be welcomed. In the discussion Mr. Lathrop said that with metallic-flame-arc lamps one man might trim as many as 300 lamps per day. If the lamps have been allowed to get out of order, the repair man and trimmer will be kept busy in looking after a much smaller number.

Rules of Electric Service in Wisconsin

A paper on "The Proposed Revision of Standards of Electric Service Now Under Consideration by the Railroad Commission of Wisconsin" was read by Mr. J. N. Cadby. The proposed rules relate principally to meters and meter testing, interruption of service, inspection and other matters. An abstract of this paper will appear in a subsequent issue.

The Milwaukee Fare Case

An able analysis of the street-railway-fare rate decision of the Railroad Commission of Wisconsin in the case of The Milwaukee Electric Railway & Light Company was given by Mr. Edwin S. Mack, of the company's counsel.

Liability Insurance

Mr. Ernest Gonzenbach, of Sheboygan, presented a report from the committee on liability insurance. Wisconsin has a workmen's compensation law, but before this

law was enacted the committee found the situation was intolerable, owing to the exactions of the liability-insurance companies. Three plans of relief were discussed, the one favored by the committee being insurance in a mutual company such as has been organized at Wausau for the purpose of carrying the liability insurance of Wisconsin manufacturers under the provisions of the workmen's compensation law. Representatives of insurance companies addressed the convention, and on the succeeding day the committee presented a supplementary report recommending that the liability insurance, both public and employers', of the members of the association be carried by the Employers' Mutual Liability Insurance Company of Wausau, a separate class to be formed for the members of the Wisconsin Electrical Association. It is said that the rates of this mutual company are approximately 40 per cent of those of the old-line casualty companies. This report, which was advisory and not legally binding on the members, was adopted.

Work-Order Systems

Mr. G. W. Kalweit described, with the aid of lantern slides, the work-order system of The Milwaukee Electric Railway & Light Company. In the lighting department of this company the classification of capital expenditure for work-order charges covers sixty-one accounts. For reserve-fund expenditure in the same department seventeen accounts are necessary.

Train dispatching and the handling of train crews on interurban railways were discussed in a paper read by Mr. Edward Hammett, of Sheboygan.

University Laboratory to Do Commercial Testing

In his paper on "The Standards Laboratory of the University of Wisconsin" Mr. F. A. Kartak announced that the laboratory is about to do commercial testing. Average fees for testing indicating instruments will run from $1.50 to $7 each; for watt-hour meters, from $2.50 to $3.50 each; for a single incandescent lamp as a standard for other tests, $2; for commercial incandescent-lamp testing, $1.50 for ten lamps or less. Mr. William Bradshaw, of Pittsburgh, gave some valuable hints in discussion.

PRESIDENT-ELECT WILLIAM H. WINSLOW

Day Loads in Small Towns

An excellent paper on "Building Up a Day Load for a Small Central Station" was read by Mr. W. E. Haseltine, of Ripon, who gave the practical results of a campaign for day load in a town of less than 4000. Mr. Haseltine's paper is abstracted on page 196 of this issue, together with curves showing the gain in load.

Resuscitation from Electric Shock

Dr. Charles H. Lemon, chief surgeon of The Milwaukee Electric Railway & Light Company, gave a valuable and interesting lecture and demonstration on resuscitation from electric shock and the use of the pulmotor. He demonstrated the prone method advocated by the N. E. L. A. and the American Medical Association. Dr. Lemon said that he had known death to result from contact with a conductor carrying 100 volts, while, on the other hand, he had treated but the day before a man who had been prostrated by a 13,200-volt shock and had recovered. The manipulation for forced respiration should be persisted in for at least one hour. It must be begun within ten minutes of the shock.

Overhead Construction

A practical paper was that of Mr. C. R. Phenicie, of Green Bay, on the "Overhead Distribution System of an Electric Utility." He said that some operators figured that the initial cost of an overhead line should be covered, roughly, by two years' gross revenue from it. The N. E. L. A. standards of overhead construction were praised. One recommendation made by Mr. Phenicie was that transformers be fused to one and one-half times the normal rating in amperes. The writer laid great stress on the need of careful, thorough and frequent inspection of overhead work. Sagging wires should be tightened at least once in two years. Mr. R. M. Howard, of Winona, said that proper overhead construction will often obviate underground agitation in municipalities. Where there are many trees a protective ground wire is a very valuable feature of a pole line. Mr. Winslow, of Superior, said that in that city where customers off the company's lines desired service it was proposed that if the extension cost the company no more than $30 there should be no extra cost to the customer beyond the regular service charge. If the cost of the extension is more than $30, the customer can pay for it himself or he can guarantee $10 a year in revenue to the company for each $25 of initial cost above the $30 base rate. On motion of Mr. C. C. Smith, a resolution was adopted providing for a committee of three to prepare standards for inspection of overhead construction.

Election of Officers and Concluding Business

On recommendation of a nominating committee, consisting of Messrs. Clement C. Smith, George B. Wheeler and J. S. Allen, officers for the ensuing year were elected as follows: President, Mr. William H. Winslow, Superior; first vice-president, Mr. William Wallen, Oshkosh; second vice-president, Mr. P. H. Korst, Janesville; third vice-president, Mr. M. C. Ewing, Wausau; secretary-treasurer, Mr. George Allison, Milwaukee (re-elected). The association voted to hand Secretary Allison $300 in recognition of the value of his services during 1912.

An advisory committee of five members, one to be the president and the other four to be appointed by the president, will look after the association's interests in matters of legislation. This committee has authority to retain counsel and to incur necessary expenses. It will also succeed to the duties of the former tax committee.

A proposal that the annual meeting of 1914 be a three-day convention was referred to the executive committee. Messrs. O. M. Rau, C. N. Duffy and H. P. Andrae were appointed a committee to represent the association in matters connected with the projected Milwaukee Electric Show. After the usual resolution of thanks adjournment was taken.

The New President

Mr. William H. Winslow, the new president of the Wisconsin Electrical Association, is a representative type of the progressive electric-service operator in a city of less than 50,000 population. He is vice-president and general manager of the Superior Water, Light & Power Company of Superior, Wis. Born in Chicago in 1867, he went to Superior in 1889, becoming cashier of his present company,

which was formed at that time. Thereafter he was promoted to be, successively, secretary, manager, general manager and vice-president. Mr. Winslow is a student, and his keenness of mind has been recognized. He was president of the Wisconsin Gas Association in 1911 and is a member of the important rate research committee of the National Electric Light Association. He is also a member of the Illuminating Engineering Society and the American Water-Works Association. He has been an occasional contributor to the *Electrical World.*

ANNUAL BANQUET

A number of ladies graced the annual banquet, held on the night of Jan. 15, with an attendance of 185. Mr. C. Nesbitt Duffy, of Milwaukee, was toastmaster, and there were speeches by Mayor Bading of Milwaukee, President Lord, and Messrs. Humphrey J. Desmond, editor of the *Catholic Citizen;* Charles L. Benjamin, advertising manager for the Cutler-Hammer Manufacturing Company; Herbert N. Laflin, a lawyer; George B. Wheeler, of Eau Claire, general manager of the Chippewa Valley Railway, Light & Power Company; August E. Stadlbauer, of Milwaukee, and Sam A. Hobson, Western manager of the *Electrical World.*

High-Speed Turbo-Alternator Design

At the meeting of the American Institute of Electrical Engineers held at New York, Jan. 10, Mr. B. G. Lamme, chief engineer of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., presented a paper on the subject of "High-Speed Turbo-Alternators—Designs and Limitations."

The real problems in turbo-alternator design, said the author, have developed with the demand for large, high-speed machines, although questions of weight, noise and through-shaft construction had been met and solved earlier in the evolution of such units. Bolted-on rotor shafts have superseded through shafts for very high speeds, and both the radial-slot and parallel-slot types of rotors have inherent advantages for machines of certain capacities. With the omission of the through shaft the parts of the shaft adjacent to the rotor core proper have been made very much heavier, and this, combined with the solid rotor core, gives great stiffness or rigidity compared with the former type. The conditions have allowed much larger cores, with correspondingly increased outputs. Radial-slot construction eliminates bending moments in the rotor teeth, putting all parts in tension under the centrifugal stress. Some cores have milled slots; others are provided with inserted teeth. Parallel slots facilitate winding construction. Four-pole, parallel-slot construction is, however, inferior to the radial-slot type in magnetic section and available copper space. Winding space is also limited by the physical requirements against bending and breaking. Again, on account of the grouping of the field copper into a narrower zone in the parallel-slot type, the heat conduction from the copper presents a more difficult problem than in the radial type.

With present high-speed machines ventilation is difficult on account of the large total loss which occurs in a limited space, requiring very large volumes of cooling air at very high velocities. Various ventilating systems were described by the author and the effects of temperature limitations upon design discussed. The troubles of proper ventilation lie principally in the large total loss expended in a very limited space. No matter how thoroughly the ventilating air is distributed through the heat-generating body or however effective the heat-dissipating surfaces may be, the total air supplied must be ample in quantity or its temperature will be raised an undue amount. Where occasional cleaning of the machine is difficult, it may be advisable to clean or filter the ventilating air before it is admitted.

In addition to considering insulating materials with reference to their mechanical strength and resistance to heat, the author discussed the general problems of temperature rise and heat flow as applied to machine design. The use of mica in various forms, he said, has solved many difficulties due to high temperatures and to static discharges. Such material withstands 125 deg. C. safely.

In turbo-alternator apparatus the temperatures actually obtained are liable to be materially higher than the usual methods of measurement will indicate. A rough measure can be obtained by exploring coils or thermocouples. However, it is evident that such coils, if located next to the copper, will not give the correct temperature measurement if the flow of heat is from the iron to the copper, while a coil next to the iron will not give the correct result with the flow from the copper to the iron. The manufacturer, with his guarantee of 40 deg. C. by thermometer, actually builds for possible temperatures of 70 deg. to 90 deg. C. in some parts of the machine, for he expects to find fairly high temperatures in some cases with exploring devices. The usual guarantee of 40 deg. C., therefore, should be considered as only a relative indication of a safe temperature in such apparatus.

Copper and iron losses in turbo-alternators are greater than those of low-speed units of corresponding rating. Protection against fire within the machine is effectively provided by doors or valves, entirely cutting off the interior of the machine from the outside air. Regulation is sacrificed to some extent, in order to limit short-circuit current, by making the armature reactance as high as the design will permit.

Although the high temperatures prevailing in turbo-generator operation are due to forcing the construction too far, this feature has been forced no further than many others. In fact, according to the author, the whole design has been carried far beyond the most economical construction from the generator standpoint alone. As a result the whole machine is more or less a compromise between desirable conditions as a generator and the most economical conditions as part of a combined turbine and generator unit.

Mr. H. G. Stott, New York, who, as chairman of the power-station committee, presided during the meeting, opened the discussion, tracing briefly the development of modern generating units from 100 kw per pole up to present possibilities of 12,000 kw to 15,000 kw per pole. Ventilation is the major problem, he said, which confronts present designing engineers.

Mr. H. G. Reist, Schenectady, N. Y., referred to the use of flexible-shaft construction for turbo-alternators, permitting increased speeds and higher outputs. To apply steel-support rings under high enough stress to offset the centrifugal forces at high speeds would require temperatures which might injure the windings. Composite mica, being built up of paper, varnish, etc., offers the possibility of charring and may also be attacked by corona discharges. Good, inherent regulation is without advantage, since hand or automatic control is necessary in all cases, and good regulation means sacrifice of both valuable economy and protection against short-circuit.

Mr. R. B. Williamson, Milwaukee, Wis., said that the disadvantages of circumferential ventilation mentioned by the author have been overcome by providing multiple air paths in the station. Air filters, while valuable in many cases, may become worse than useless when clogged or dirty. A cloth filter mentioned, however, handled 40,000 cu. ft. of air per minute during eighteen months without being cleaned. Liability of break-downs between conductors, rather than to ground, make mica insulation desirable between turns.

Mr. Philip Torchio, New York, pointed out that increased rotor lengths may require expensive real estate, so that

while cheapening machine construction one may be adding heavily to station costs. Comparing the results of radial and parallel-slot design, he exhibited curves showing short-circuit currents forty times full-load current for the radial-slot machine and thirteen times for the parallel-slot generator of similar characteristics. This difference in reactance Mr. Torchio traced to field construction.

Mr. C. J. Fechheimer, Ampere, N. J., observed that good rotor design is necessarily a good compromise between the five limiting factors of stresses, temperature, cost, regulation and ability to maintain voltage. Safety demands conservative treatment of stresses, but, second in importance, comes the temperature limit for charring insulation. Commercial design often requires proportioning of parts so that dies, etc., shall be interchangeable for future machines.

Mr. W. L. Emmet, Schenectady, N. Y., pointed out that purchasers should not overlook the problems and difficulties met in designing turbine machines lest they force upon manufacturers conditions undesirable in both construction and operation. While mica is indestructible at 125 deg. C., the materials with which it is usually mixed may undergo destructive distillation at even lower temperatures.

Mr. Paul M. Lincoln, Pittsburgh, Pa., spoke of the importance and close interrelation between the problems of ventilation, temperature and insulation. High air velocities are necessary in the restricted spaces of modern machines, and these extreme velocities may of themselves generate heat. Since electrical insulation cannot be designed with good heat conductivity, high thermal drops in the insulation must be tolerated.

Mr. Peter Junkersfeld, Chicago, emphasized the desirability of smooth air passages without sharp corners when designing ventilating shafts. The speaker also recommended the provision of thermometer coils giving internal-machine temperatures, which may be useful as an indication when the machine becomes clogged and ready for cleaning.

Mr. H. M. Hobart, Schenectady, N. Y., spoke of cleaning air by passing it through water sprays. This method has the advantage of adding desirable humidity, besides lowering the temperature of the air. Good engineering design, he said, should include consideration of depreciation and obsolescence. Past history has shown clearly enough that, after ten years' use at the outside, a given machine will be far inferior to one of recent design.

Mr. W. L. Waters, Pittsburgh, Pa., told how energy wasted by inefficient ventilating blowers might actually warm the air, reversing the result sought. One machine, ventilated by a 100-hp blower, really ran cooler when the blower was taken off. Carefully worded specifications and elaborate, detailed guarantees are usually not only of little value, said Mr. Waters, but are often inadvisable from the false idea of security they afford. Prospective purchasers should realize that, after all, they must necessarily depend on the ability and standing of the manufacturer.

Mr. C. A. Adams, Boston, Mass., showed that if the current density in the copper remains unchanged the armature copper loss will vary inversely as the peripheral velocity. He also outlined methods of calculating heat escape from alternator coils.

Mr. A. B. Field, Pittsburgh, Pa., spoke of difficulties in getting steel suitable for turbo-field construction. Although there are many more machines running at their critical speeds than is generally believed, the advantages of freedom from unbalancing due to minor short-circuit conditions make lower speeds desirable.

In closing the discussion the author, Mr. Lamme, spoke only of the subject of temperature, insisting that 125-deg. C. internal temperatures have been prevalent longer than is generally realized. Mica, when properly put on, he declared, is safer at 125 deg. than other insulataions at 90 deg. Even fibrous insulation in one case ran three months at 125 deg., while mica would have stood indefinitely.

Railroad Commission Makes Exhibit at Wisconsin Convention

For the first time in its history the Railroad Commission of Wisconsin exhibited at a public-utility convention during the meeting of the Wisconsin Electrical Association in Milwaukee on Jan. 15 and 16. The experiment was entirely successful, the room being a great center of attraction. The exhibit was educational in its nature, being designed to show the electrical men what the commission is doing. The manner of testing meters was illustrated; also the method of making street-lighting and interior-illumination tests. There was a map showing the electric power plants of the State and the districts for inspection work. Signs about the room called attention to the importance of insulating guy wires, of having streets illuminated instead of simply lighted, and of eliminating meter errors instead of compensating for them. One of the most interesting features of the exhibit was a number of incandescent lamps mounted upon a display board in the order of their candle-power. The lamps were all standard 16-cp carbon lamps which had been in service for varying periods of time, the brightest ones giving something above the standard rating and the blackest one giving less than 11 cp. Above these lamps was plotted the curve of candle-power and of efficiency. Mr. J. N. Cadby, of the engineering staff of the Railroad Commission, was in attendance and read a paper before the association.

The Conservation Movement

In a speech before the American Forestry Association at Washington recently Hon. Walter L. Fisher, Secretary of the Interior, said that the opponents of the conservation movement are devoting themselves chiefly to the accusation that the conservationists represent a purely negative principle and that the policy of the conservation movement is to withdraw from the fields of activity the national and natural resources and to prevent their effective and prompt development. In denying this accusation, the speaker said that the water-powers of the country have been tied up to its great disadvantage, because while the fuel resources are destroyed in their use the water-power that is developed is perpetual and continuous, and its use is the most living and vital example of conservation. It is therefore to the interest of the country and its citizens, Secretary Fisher said, to urge and to secure the adoption of a policy which will permit these resources to be used as promptly and as fully as possible. The reason why so little has been accomplished, he thought, was not the inherent difficulty of the situation, but the obstacles which have been intentionally thrown in the way of that policy by people seeking to discredit the movement.

It happened that in March, 1911, by a rider attached to an appropriation bill a provision was inserted which gave the head of any department having utilization of public lands and reservations the right, under rules and regulations prescribed by him, to grant an easement for a period not to exceed fifty years for electric transmission lines and for telegraph and telephone lines. At the end of the rider a provision was added that those who already had revocable permits for a particular transmission line could obtain grants upon the same terms and conditions as were prescribed for others. Seizing upon this rider as the first and only opportunity, the Secretary of the Interior put into effect certain rules and regulations to give the constructive policy something of an impetus. These regulations, according to Secretary Fisher, went farther than it was thought necessary and wise to go, but the extreme view was adopted and the regulations were sent out to all the power interests in the United States, notice being given them at the same time of a conference at which the Secretary of the Interior would be glad to listen to suggestions for modifications.

One of the particular interests represented at that conference was the Great Falls Power Company, which asked nothing from the federal government and needed nothing from the federal government so far as the power site of itself was concerned, but needed a right-of-way over public lands and national forests for its transmission lines. The company was then engaged in active negotiations with the Chicago, Milwaukee & Puget Sound Railroad system for the electrification of its road through the mountain regions where water-power is available. The power company had a revocable transmission-line permit to cross the public domain, but the railroad company was unwilling to make a contract with it unless a permanent permit could be obtained. (For an account of the permit accepted by the power company see the *Electrical World*, Jan. 11, 1913.) Secretary Fisher stated that when the power company made the contract with the railroad company the contract was submitted to the Department of the Interior, whose purpose it was to prevent by a manipulation between two interests an excess charge for the electricity purchased by the railroad company which would be a bar to effective rate regulation by the Interstate Commerce Commission. The great significance of this particular grant, he said, is twofold—first, in that it marks the first step toward the electrification of the transcontinental railroads, and, second and in Secretary Fisher's judgment far more important, because it makes effective the sort of regulations regarding large power interests for which conservationists have contended.

Annual Report of the Hydro-Electric Power Commission of Ontario

The record of Ontario's publicly owned power system for the fiscal year of 1912 is strikingly set forth in the annual report of the commission, now being compiled for distribution. A statement of receipts, expenditures and capital cost of the Niagara system to the end of the year has just been made public by the chairman of the commission, Hon. Adam Beck, in advance of the rest of the report. For the first quarter of the fiscal year of 1912 the revenue of the commission was $108,920.08 with a load of 43,149 hp. During the next three months the income was $117,213.59 and the load 58,326 hp. The increase was more rapid during the third and fourth quarters, when the receipts were $127,986.00 and $157,681.88 respectively and the load 64,306 hp and 80,723 hp respectively. The total revenue for the year reached $511,801.88. These receipts were for energy delivered, including charges for administration, general expenses, operation, maintenance and interest. The yearly expenditure reached $456,635.43, and the expenditure for the fourth quarter, which showed a large increase in the quantity of energy delivered, was only $28,000 above that of the first quarter, indicating the steady decrease in percentage of cost with increase in energy consumption. The surplus for the year was $55,166.45, which has been nominally set aside as a depreciation reserve.

The total capital expenditure upon the system up to the end of the provincial year (Oct. 31) was $4,158,824.24. This is classed under four headings—right-of-way, transmission lines, transformer stations and distribution stations, as follows:

Transmission lines:	
Steel tower lines	$1,537,977.72
Wood pole lines	493,037.99
Telephone lines	129,668.95
Relay system	54,537.32
Conduit and cable system	40,907.88
Total	$2,256,129.86
Transformer stations	1,322,806.73
Right-of-way	542,088.85
Distributing stations	37,803.89
Total cost	$4,158,829.24

Model Public Utility Bill

The department on regulation of interstate and municipal utilities of the National Civic Federation, of which Mr. Emerson McMillin is chairman, will hold a meeting of its executive council in New York on Jan. 25. At that meeting it is hoped to clear away most of the matters that remain for action in connection with the model bill regulating public utilities which the federation has in preparation. A report on the work of the department will be presented at the annual convention of the federation to be held in New York Jan. 28 and 29.

The importance of the work undertaken by the National Civic Federation may be gaged from the personnel of the following sub-committees having the matter in charge:

Rates.—Mr. Halford Erickson, Railroad Commission of Wisconsin (chairman); Messrs. Charles R. Crane, Chicago; F. A. Delano, president Wabash Railroad, Chicago; Alexander C. Humphreys, president Stevens Institute, Hoboken, N. J.; F. K. Lane, Interstate Commerce Commission, Washington, D. C.; J. C. Lincoln, manager traffic bureau, Merchants' Association, New York; Theodore N. Vail, president American Telephone & Telegraph Company, New York.

Control of Service.—Mr. W. D. Kerr, National Civic Federation (chairman); Messrs. H. C. Abell, American Light & Traction Company, New York; Union N. Bethell, vice-president New York Telephone & Telegraph Company; M. S. Decker, Public Service Commission, Second District, Albany; B. A. Eckhart, Chicago, Ill.; Charles L. Edgar, president Edison Electric Illuminating Company, Boston; D. O. Ives, manager transportation department, Chamber of Commerce, Boston, Mass.; W. D. Pence, Railroad Commission, Madison, Wis.; Robert R. Prentis, chairman State Corporation Commission, Richmond, Va.; R. N. Searle, vice-president Rochester (N. Y.) Railway & Light Company; Alfred H. Smith, vice-president and general manager New York Central & Hudson River Railroad, New York; Charles A. Stone, Stone & Webster, Boston; William R. Wheeler, traffic manager, Chamber of Commerce, San Francisco, Cal.; W. J. Huddle, consulting engineer, Madison, Wis.

Accounts and Reports.—Mr. E. M. Bassett, formerly Public Service Commissioner, First District, New York (chairman); Messrs. J. E. Allison, Public Service Commission, St. Louis, Mo.; Edward G. Connette, president International Railway Company, Buffalo, N. Y.; W. M. Daniels, Board of Public Utility Commissioners, New Jersey; C. N. Duffy, vice-president Milwaukee (Wis.) Electric Railway & Light Company; B. S. Garvey, general auditor Chicago Telephone Company; Edwin Gruhl, North American Company, New York; Adna F. Weber, chief statistician Public Service Commission, First District, New York; R. H. Whitten, Public Service Commission, First District, New York.

Control of Capitalization.—Mr. M. R. Maltbie, Public Service Commission, First District, New York (chairman); Messrs. W. J. Clark, General Electric Company, New York; George B. Cortelyou, president Consolidated Gas Company, New York; B. H. Meyer, Interstate Commerce Commission, Washington, D. C.; James Speyer, New York; Timothy S. Williams, president Brooklyn Rapid Transit Company.

Franchises.—Mr. Blewett Lee, Illinois Central Railroad, Chicago (chairman); Messrs. Alfred L. Baker, attorney, Chicago; H. M. Byllesby, Chicago; John H. Carlisle, Watertown, N. Y.; Samuel Insull, president Commonwealth Edison Company, Chicago; John H. Roemer, Wisconsin Railroad Commission, Madison, Wis.; Mason B. Starring, president United Railways Investment Company, New York; John H. Wigmore, dean law school, Northwestern University, Chicago; Thomas N. McCarter, president Public Service Corporation, Newark, N. J.; Josiah T.

Newcomb, New York; Leo S. Rowe, professor University of Pennsylvania, Philadelphia.

Ways and Means.—Mr. F. Q. Brown, New York (chairman); Messrs. William Barbour, presdent Linen Thread Company, New York; T. C. du Pont, Wilmington, Del.; John H. Gray, Minneapolis; V. Everitt Macy, New York; Emerson McMillin, New York; Josiah T. Newcomb, New York; Albert Shaw, New York; Isaac N. Seligman, New York; F. C. Walcott, New York; J. G. White, New York; Arthur Williams, New York; T. S. Williams, Brooklyn.

Safety of Operation.—Mr. Arthur Williams, New York Edison Company (chairman); Messrs. W. G. Lee, Cleveland, Ohio; William B. McKinley, president Illinois Traction System, Peoria, Ill.; W. S. Stone, Brotherhood of Locomotive Engineers, Cleveland, Ohio; Daniel Willard, president Baltimore & Ohio Railroad; W. R. Willcox, Public Service Commission, First District, New York.

Form.—Mr. John H. Gray, director of investigation, New York (chairman); Messrs. W. S. Allen, American Telephone & Telegraph Company, New York; E. W. Bemis, Chicago; Charles P. McCarthy, Legislative Reference Library, Madison, Wis.; Edgar J. Rich, Boston, Mass.

Interstate Commission Investigation of Telephone Company

The Interstate Commerce Commission, to which Attorney-General Wickersham has referred the case of the so-called "telephone trust," has undertaken the investigation of the American Telephone & Telegraph Company. In his letter of transmissal to the chairman of the Interstate Commerce Commission, the Attorney-General calls attention to the policy of the American Telephone & Telegraph Company as set forth in its annual report for the year ended Dec. 31, 1910. In this report it is stated that the American Telephone & Telegraph Company is a centralized, general administration for all the Bell companies. It does the financing for the extension of the business; it furnishes the engineering, operating and other experts; it maintains a productive and protective organization so far as patents are concerned; it defends all the companies against all infringements; it undertakes to bring about improvements by working out the ideas and suggestions of others; it avoids all duplication of effort, of experiments, apparatus, etc.; it looks after the public relations of the companies, and performs all that service which is common to all, leaving to the local companies the local management.

According to the Attorney-General, representatives of many of the independent telephone companies have complained to the Department of Justice that the American Telephone & Telegraph Company has not contented itself with the normal extension of its system, but that it has purchased competing lines in such a manner and in such circumstances as to destroy competition. It is also contended that it has refused, either directly or through competitve and originally independent lines acquired by it, to make connections between the local lines not owned or controlled by it and its own long-distance lines; that it has discriminated between the lines of the Western Union Telegraph Company, in which it owns a large interest, and the lines of the Postal Telegraph Company in cases where subscribers to its telephone lines requested to be put into communication with the Postal Telegraph Company. It is also complained that the rates maintained by the company are unusually high in places and between communities where there is no competition, in contrast to the low rates prevailing where competition exists.

The Attorney-General is of the opinion that many of the questions cannot be appropriately dealt with by the law department of the government, but should be made the subject of regulation after a careful investigation of the whole subject by the Interstate Commerce Commission. He states that the powers vested in the commission by statute are ample, and that although the public utility commissions or similar bodies in the various states have jurisdiction in such matters as are complained of, such regulation cannot be a satisfactory method of ultimate solution of the questions arising out of telephone operation.

The interstate commerce act, as at present in force, makes telephone, telegraph and cable companies engaged in sending messages from one state to another common carriers within the meaning and provision of the act, and makes it unlawful for any common carrier to give any undue or unreasonable preference or advantage to any particular person, etc., or to any particular description of traffic, or to subject any particular person, company or locality, etc., to any unreasonable prejudice or disadvantage in any respect whatsoever.

No comprehensive investigation into the organization, management and conduct of telephone companies has, so far as the Attorney-General is aware, ever been had by governmental agency. The investigation of the law department has dealt only with suggested violations of the Sherman anti-trust act; but the whole problem of the relation of the government to the transmission of intelligence is one so far-reaching in its importance, and one that so affects the welfare of the community, that it appears to Attorney-General Wickersham to be a subject which should be thoroughly studied from the standpoint of the public, in order that a governmental policy with respect to the telephone and telegraph business may be intelligently formulated and adopted. All of the information which has been collected by the law department has been placed at the disposal of the Interstate Commerce Commission.

Public Service Commission News

Wisconsin Commission

The annual report of the Wisconsin Railroad Commission has been submitted to the Governor. The total number of utilities making report to the commission was 1136, an increase of forty-six over the year ended June 30, 1911. Of this number 244 were electric, 54 gas, 156 water, 666 telephone and 16 heating utilities. During the year 1096 cases were disposed of, as against 703 cases the preceding year. The electric-utility cases amounted to 248, or an increase of sixty-three. Forty-one decisions on formal electric-utility cases were issued. Authority to issue stocks, bonds and other evidences of indebtedness was granted during the year to 138 corporations, involving the total sum of $77,615,744, divided as follows: Stocks, $5,132,687; bonds, $61,330,900; equipment trust certificates, $10,055,000 notes, $1,097,166.

During the year the electric railway business showed a considerable development. For all classes the value of property and plant at the beginning of the year was $57,818,859, or an increase of 7 per cent over the corresponding figures for 1911. Operating revenues increased 8.1 per cent over 1911 and 14.33 per cent over 1910. The increase in net income from 1910 to 1912 was 21.3 per cent. In the case of electric utilities the value of the property at the beginning of the year was given as $39,933,952, or an increase of 8.35 per cent over 1911. The construction during the year, however, showed a decrease of 29.38 per cent over the year previous. The total operating revenues increased 8.79 per cent and the net income 17.05 per cent. For gas utilities the value of the property at the beginning of the year was given as $25,418,734 and for telephone utilities as $16,787,143. New telephone construction increased 38 per cent.

The report makes note of the increasing service which the commission is rendering by acting in the capacity of a board of arbitration on matters of dispute between munici-

palities and public utilities, which in the ordinary procedure could not be brought before the commission. In the matter of the controversy between the city of Waupaca and the Waupaca Electric Light & Railway Company, the commission's opinion embodied one of the most involved and thorough investigations along lines of illuminating engineering that have ever been made.

The report notes that eight suits have been brought against the commission, one of which involved an electric utility. But one case has been decided, and that in favor of the commission.

In the matter of the application of the Madison Gas & Electric Company to review an ordinance of the city of Madison requiring the removal of poles and wires from certain streets, the commission has determined that the ordinance is unreasonable and therefore null and void. The decision called attention to the fact that under the present system of street lighting it would be impossible to remove more than one-half of the poles, and that consequently it would be unreasonable to require the company to expend over $1,000 each for the removal of the remainder. The company, in the commission's opinion, has done all that it could reasonably be expected to do until such time at least as a change in the system of street lighting shall make it necessary to remove the suspension poles now in use.

The Monticello Electric Light Company has been authorized to abolish its present practice of charging a meter rental of 10 cents per month and to substitute therefor a minimum monthly bill of 50 cents.

Rhode Island Commission

The Public Utilities Commission has presented its first annual report to the Legislature. The board recommends that its powers be broadened and that statutes be enacted giving it authority to make a physical valuation of all the public utilities in the State. Rates have been filed with the board by forty-five utilities, and the commission states that this action has operated to fix the future charges of the utilities upon a uniform basis for every one of a like class, with the prevention of discriminations. The only discriminations that now exist are those arising from contracts entered into between public utilities and their customers prior to the enactment of the public-utilities law, and such contracts are extremely limited in number and will practically all expire by limitation within the next few years.

Current News and Notes

High-Tension Electrical Laboratory for Harvard.—The president and fellows of Harvard University have acknowledged a donation of $50,000 from Miss Harriet Otis Cruft to be used for a new high-tension electrical laboratory, which will be housed in the Cruft Memorial Building.

* * *

To Harness the Columbia River.—Legislation is proposed whereby the States of Oregon and Washington will harness the Columbia River at Five-Mile Rapids, 2 miles above the lower entrance of the Celilo Canal and 5.5 miles up the Columbia from The Dalles. A minimum of 100,000 hp may be developed. A commission of competent hydroelectric engineers to investigate and report to the Legislature is asked for.

* * *

Expiration of American and Foreign Patents.—In a decision handed down on Jan. 20 the Supreme Court holds that American patents on inventions patented in foreign countries expire with the expiration of the foreign patent, notwithstanding claims that the treaty of Brussels of 1900 provides otherwise. The decision was rendered in a case between the Cameron Septic Tank Company and the city of Knoxville, Iowa.

Resale Price on Patented Articles.—The Supreme Court, it is announced, will review a case under the patent laws involving the right to fix the resale price on patented articles. A druggist of Washington, D. C., attempted to sell a patent medicine at a price below that fixed by the manufacturer, and an action was brought for infringement of the patent rights. This case and the "corn flakes" case will be followed with the greatest interest.

* * *

Water from New York Barge Canal for Power Purposes.—The deputy conservation commissioner of the State of New York has proposed that the Conservation Commission be authorized to use the surplus water of the Barge Canal for the generation of electricity. It is also proposed to supply the municipalities within the district with electricity at cost and to create a division of hydroelectrc power in charge of a deputy commissioner at a salary of $7,000 a year.

* * *

Society of Electrical Development, Inc.—An invitation will be issued shortly by the Society for Electrical Development to the entire electrical industry to attend a conference at the Engineering Societies Building, New York, for the purpose of discussing concrete methods for carrying out the publicity plan through which the society hopes to carry on its co-operative movement for increasing electrical trade. An account of the meeting of the society's organization committee on Jan. 14, at which the by-laws were approved and directors and officers were elected, appeared on page 128 of the *Electrical World* for Jan. 18, 1913.

* * *

Proposed Merger of City of Chicago and Sanitary District.—Merger proposals seem to be infectious. A resolution has been introduced in the City Council of Chicago by Alderman Theodore K. Long looking toward the merging of the Sanitary District of Chicago with the city of Chicago. The Sanitary District is a municipal corporation with geographical boundaries including nearly all the city of Chicago, with considerable territory outside of it. It was formed to divert the flow of the Chicago River from Lake Michigan to the Desplaines River and thus through the Illinois River to the Mississippi, to save the source of the city's water supply from contamination. One reason why the city did not do this work itself was because it could not do so constitutionally without exceeding its debt limit. The District has expended about $70,000,000, and Alderman Long's idea is that inasmuch as the Sanitary District has nearly fulfilled the purpose for which it was organized—that is, the safeguarding of Chicago's water supply—it should now be merged in the city.

* * *

To Regulate Electric Transmission Companies in Massachusetts.—Legislation to curb the powers of the electric transmission companies which have secured control of the State's waterways will be recommended by the Massachusetts Gas and Electric Light Commission in a special report to be submitted to the Legislature shortly. At present these companies are financing and selling securities with practically no restriction whatever, while all the gas and electric lighting concerns in the State are rigidly supervised. The fear is that the transmission companies, heavily capitalized, will reach out into the lighting field and that they will then be in a position to force many of the small local lighting companies to sell at almost any price offered them, thus destroying competition. It is understood that the commission will recommend to the Legislature that these transmission companies be placed under its supervision and be subjected to the same restrictions regarding the issue and sale of securities to which the smaller concerns are subjected. Plans are also afoot to stop the sale in other states of electricity generated by the water powers of Massachusetts.

SOCIETY MEETINGS.

Minnesota Convention.—It is announced that the next convention of the Minnesota Electrical Association will be held in St. Paul on March 11, 12 and 13. Mr. E. Holcomb, of the Consumers' Power Company, has been elected president.

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Byllesby Convention Postponed.—The fourth annual convention of H. M. Byllesby & Company and affiliated companies, which was arranged to be held in Chicago Jan. 23 and 24, has been postponed until June. This action has been taken on account of events which prevent the attendance of some of the officials of the firm and many managers of local properties.

* * *

New York State Electrical Contractors' Association.—At the annual meeting of the New York State Electrical Contractors' Association, held in Syracuse, N. Y., on Jan. 21, officers for the current year were elected as follows: President, Mr. F. W. Newman, Albany; vice-president, Mr. H. N. Smith, Syracuse; secretary, Mr. G. W. Russell, Jr., New York, and treasurer, Mr. J. P. Burn, Schenectady.

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Sons of Jove at New York.—Mr. F. M. Tait, president of the National Electric Light Association and general manager of the Dayton (Ohio) Electric Lighting Company, spoke before the Sons of Jove luncheon at Michaud's Restaurant, Broadway and Forty-second Street, New York, Jan. 22. A lecture on and a demonstration of the pulmotor are announced for the next meeting, to be held at the same place, Feb. 6.

* * *

Cosmopolitan Company Section of N. E. L. A. in Chicago.—At the recent annual meeting of the Cosmopolitan Electric Company Section of the National Electric Light Association in Chicago officers were elected as follows: Chairman, Mr. E. Gilroy; vice-chairman, Mr. H. E. Wulfing; treasurer, Mr. H. A. Weigle; secretary, Mr. C. F. Brown; executive committee, Messrs. J. C. Furlong, A. W. Marriner and C. T. Wickman.

* * *

San Francisco Electrical Development League.—At a meeting of the Electrical Development League of San Francisco on Jan. 14 an address was delivered by Mr. J. R. Bibbins, resident engineer for Bion J. Arnold, traction engineer, of Chicago, on the growth and development of San Francisco and its transportation facilities, the address being illustrated by stereopticon views of San Francisco and other large cities of the country.

* * *

Rejuvenation in Milwaukee.—A successful rejuvenation of the Jovian Order was held at the Republican House, Milwaukee, on Jan 16 in connection with the annual convention of the Wisconsin Electrical Association. A class of twenty-three candidates was initiated, and later there was a banquet at which Mr. Sam A. Hobson, of Chicago, third Jupiter, acted as toastmaster, speeches being made by a number of Jovians from Milwaukee, Chicago and elsewhere.

* * *

Group Meeting of Societies in Milwaukee.—About Feb. 15 it is planned to hold a joint meeting of a number of technical societies in the Auditorium, Milwaukee. It is expected that the societies participating will be the Chicago Section of the Illuminating Engineering Society, Wisconsin Engineering Society, Milwaukee Engineering Society, Milwaukee Section of the American Institute of Electrical Engineers, Milwaukee Company Section of the National Electric Light Association, Milwaukee Section of the American Chemical Society and Milwaukee Electrical League.

Michigan Engineering Society.—At the thirty-fourth annual meeting of the Michigan Engineering Society held at the University of Michigan, Ann Arbor, Jan. 7-9, papers were read, among others, as follows: "Preliminary Investigations for Water-Power and Water Supply," by Mr. Robert E. Horton, Albany, N. Y.; "The Need of Hydraulic Data," by Messrs. L. E. Ayres and B. K. Holland, and "Hydroelectric Development in Michigan," by Mr. H. Von Schon. Prof. H. W. King led a discussion on the water-power resources of Michigan. Mr. W. W. Tefft, of Jackson, was elected president.

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Pittsburgh Jovian League.—Formal consolidation of the Electrical Boosters' Club of Pittsburgh, Pa., with the local Jovian Electrical League was effected Jan. 9 at a luncheon at the Fort Pitt Hotel. Mr. M. F. Knapp, Jovian statesman, presided, and addresses were made by Messrs. G. W. Provost and Henry Harris. Officers of the new league will be elected shortly, the board of control to include representatives of local utility companies, manufacturers, jobbers and contractors. In addition to the weekly luncheons, there will be business meetings on the first Saturdays of March, June and December. A Jovian theater party is announced for Feb. 7 at the Nixon Theater, Pittsburgh.

* * *

Colorado Electric Club Elects Officers.—At the meeting of the board of directors of the Colorado Electric Club on Jan. 14 officers were elected as follows: President, Mr. Benedict Shubart, of Linrooth, Shubart & Company, Denver; first vice-president, Mr. Joseph Reardon, of the Clayton school and former city electrician of Denver; second vice-president, General Irving Hale, General Electric Company, Denver; secretary-treasurer, Mr. C. F. Oehlmann, Denver Gas & Electric Light Company. At a meeting on Jan. 16 Mr. W. H. H. Cranmer, local highway commissioner, spoke on "Efficiency in Municipal Affairs." The club's membership is now 727, and the attendance during the last year averaged 112.

* * *

Western Association of Electrical Inspectors.—The eighth annual meeting of the Western Association of Electrical Inspectors will be held at the Planters' Hotel, St. Louis, Mo., Jan. 28, 29 and 30. The following addresses are announced: "Electrical Porcelain: Its Manufacture and Uses," by Mr. F. A. Driscoll, Chicago; "High-Voltage Transmission-Line Requirements," by Mr. H. B. Gear, Chicago; "Electrical Laboratory Test Problems," by Mr. B. H. Glover, Chicago; "The 660-Watt Branch Circuit and Its Relation to Mazda Lamps," by Mr. W. H. Blood, Jr., Boston, Mass.; "The Present Status of Grounded Secondaries," by Mr. W. J. Canada, president of the inspectors' association, Denver, Col. Reports are also scheduled from the following chairmen of committees: National Electrical Code, Mr. F. D. Varnam, St. Paul, Minn.; outside wiring, Mr. W. Michaelsen, Omaha, Neb.; theater wiring, Mr. F. L. Lucas, Toledo, Ohio; electric signs, Mr. E. Anderson, Minneapolis, Minn.; show-window lighting, Mr. F. P. McGough, Omaha, Neb.; instructions for public safety, Mr. T. D. McColl, Toledo, Ohio; underground systems, Mr. H. T. Wreaks, New York; induction motors, Mr. F. J. Burch, Chicago; electric hoists, Mr. H. C. Horstmann, Chicago; laws and ordinances, Mr. W. S. Boyd, Chicago; architects' specifications, Mr. F. H. Moon, Indianapolis, Ind.; signal systems, Mr. F. S. Anderson, Evanston, Ill.; public safety, Mr. W. J. Canada, Denver, Col.; electric traction systems, Mr. F. R. Daniel, Indianapolis, Ind.; rubber-covered wire, Mr. V. H. Tousley, Chicago, Ill. On Tuesday evening a complimentary dinner will be tendered to members. Mr. W. S. Boyd, 76 West Monroe Street, Chicago, is secretary-treasurer of the inspectors' association.

High-Tension Transmission System in Central Georgia

Substations and 66,000-volt steel-tower lines of the Central Georgia Transmission Company—Towers of special construction for city circuits

THE Central Georgia Transmission Company was organized in December, 1911, to distribute and sell energy in large quantities in certain sections of middle Georgia contiguous to the territory supplied by the Central Georgia Power Company, from which company the transmission company obtains its supply of energy under a long-term contract. The Central Georgia Transmission Company has an authorized capital of $2,000,000 common stock and $2,500,000 first-mortgage 5 per cent bonds. It is one of the Georgia Light, Power & Railway's properties and is under the general direction of Messrs. A. B. Leach & Company, New York City. The head office of the company is located at Macon, Ga.

Transmission System

The main part of the transmission system runs for a distance of 34 miles from Atlanta, Ga., through Hampton to Griffin, Ga., at which point it connects with the system of the Central Georgia Power Company. A branch line, 10 miles in length, runs from the power plant of the Central Georgia Power Company to Monticello, Ga. Substations are located at Atlanta, Hampton and Monticello.

Final surveys were completed by Jan. 1, 1912, and the clearing of the right-of-way, 150 ft. wide, was immediately undertaken. This right-of-way runs through the counties of Spalding, Henry, Clayton and Fulton, principally rough country, some of which was covered with virgin timber, but in spite of very bad weather the clearing was completed by March 1, 1912.

Towers

The towers have a somewhat different arrangement of conductors from that heretofore in use on the ordinary transmission tower. In the accompanying illustrations it will be seen that they carry two overhead ground wires for protection against the severe lightning experienced in the section served, and, furthermore, the conductors on each side of the tower are staggered to prevent contact between wires due to unequal unloading of sleet following heavy sleet storms, which are not uncommon in that territory.

The insulators are of the suspension type for the reason that the pin-type insulators have proved unsatisfactory in this territory for voltages above 30,000. The transposition of the conductors, there being one complete roll, is made upon three transposition towers, 10 miles apart, one-third of the roll on each tower so as to eliminate transposition in the span.

The last 2 miles of this line is through the suburbs of Atlanta, running for some distance along the curb line. It was therefore necessary to design a special type of tower to meet these conditions. The city towers are set in concrete with approximately 13 cu. yd. per tower foundation.

The strain and suspension towers are 16 ft. square at the base and are approximately 60 ft. high. In three in-

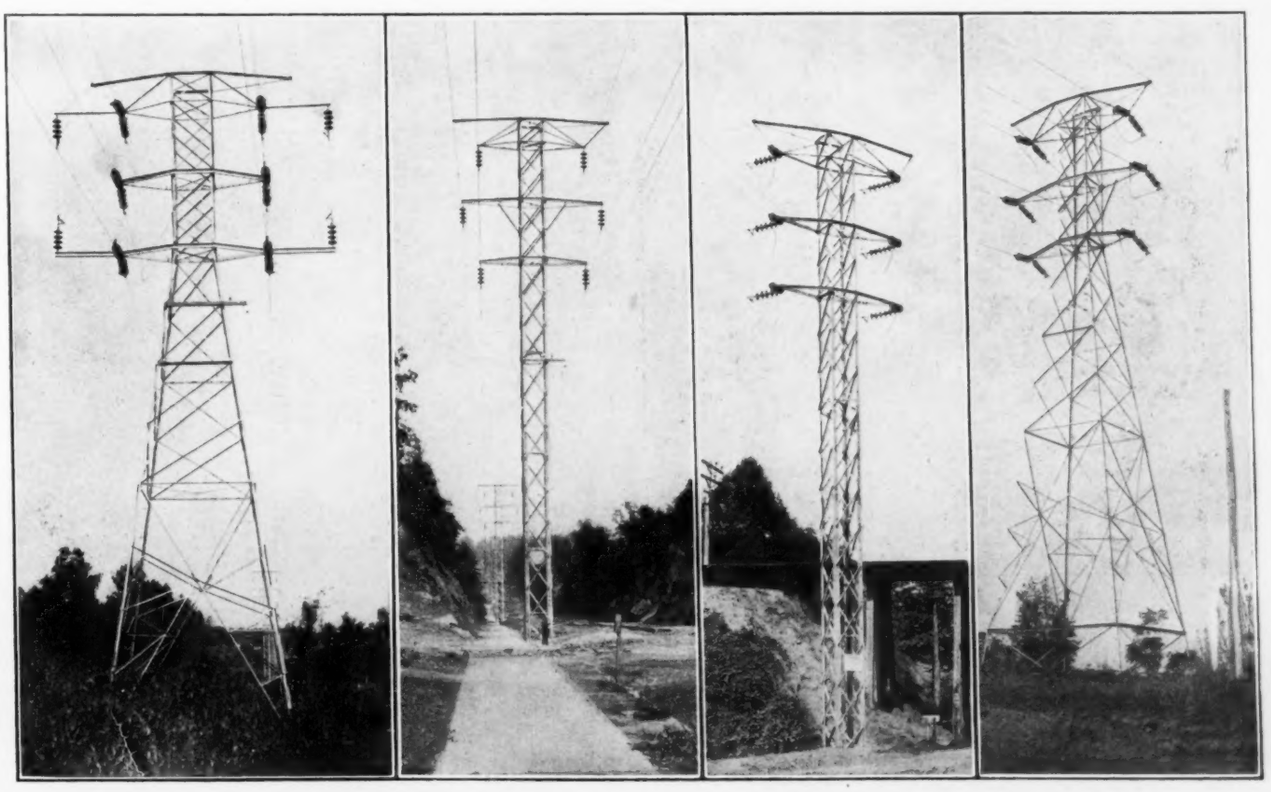


FIG. 1—TYPES OF INTERMEDIATE AND STRAIN TOWERS USED IN THE COUNTRY AND IN CITY STREETS

stances a 10-ft. extension is used, making a 70-ft. tower. The height to lowest cross-arm is 44 ft., allowing for a 25-ft. clearance of conductors from ground under the worst conditions. All towers carry two overhead Siemens-Martin galvanized strand-steel ground wires ⅜ in. in diameter and two circuits of three aluminum 167,830-circ. mil wires, equivalent to No. 0 copper.

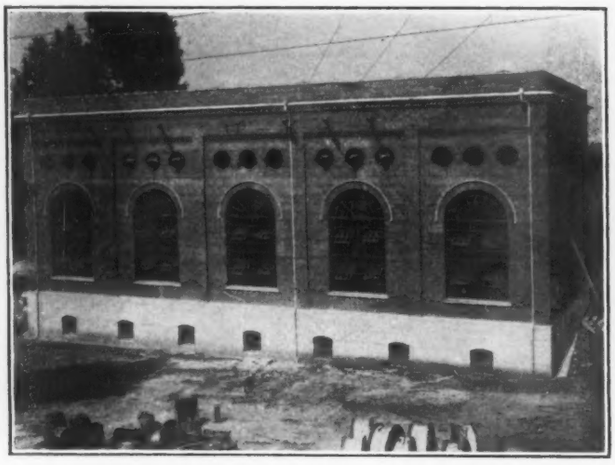


FIG. 2—SUBSTATION IN ATLANTA

The suspension towers are designed for a breast pull of 11,000 lb., a torsional pull of 6,000 lb. and a vertical load of 1200 lb. applied at the end of each cross-arm, with a 1500-lb. pull at the ground-wire supports, and weigh 3200 lb.

The strain towers were located approximately one to a mile and at angles and long spans, and they are designed for a breast pull of 16,000 lb., a torsional pull of 9000 lb. and a vertical load of 2000 lb. applied at the end of each cross-arm, and for a 2000-lb. pull at the ground-wire supports, and weigh 3800 lb. These towers were not set in concrete except where the earth was poor.

The city-type tower was built to meet the same loads as the strain tower, but the span was shortened to an average of 425 ft., whereas the average span on the other towers is 550 ft., the longest span being 1100 ft.

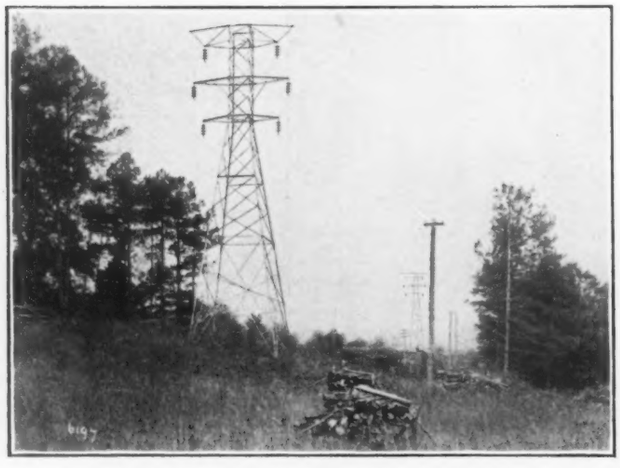


FIG. 3—A 150-FT. RIGHT-OF-WAY IN THE OPEN

The wire was strung to meet the combined conditions of 0 deg. Fahr., ⅜-in. ice and 30-mile wind, under which conditions the elastic limit of the wire would not be exceeded. The telephone lines are carried on a separate wooden pole line except for the last 2 miles of the line. Energy is transmitted at 66,000 volts and delivered to customers at 11,000 and 2300 volts.

Substations

The Atlanta substation is a brick and concrete structure, fireproof throughout. The station is designed for 900 kw, of which one bank, or 4500 kw, was first installed. The second bank is now being installed, owing to the increased demand on the station, and will be ready in February.

The two lines entering this substation come through oil

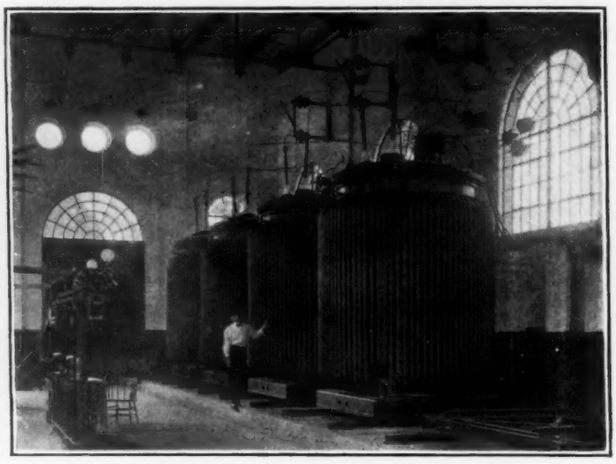


FIG. 4—INTERIOR OF ATLANTA SUBSTATION

circuit-breakers to the high-tension bus, which is separated into two parts by means of disconnecting switches. The leads from the low-tension side of the transformers go through oil switches to the low-tension buses, which are mounted in a brick bus structure. The low-tension buses are divided into two parts by means of disconnecting switches, and from each part three 11,000-volt feeders lead out from the station. Air-type choke coils are used on both high-tension and low-tension leads of each bank of transformers, and electrolytic arresters are connected to both high-tension and low-tension buses.

All the high-tension apparatus is on the main floor of the substation, and the low-tension bus structure is in the basement. All switches are electrically operated from the switchboard on the main floor by a 44-cell, 80-amp-hr. storage battery, charged by means of a rectifier.

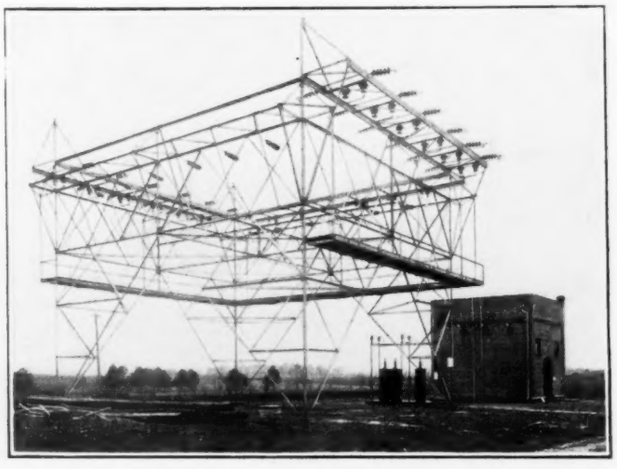


FIG. 5—SWITCHING TOWER AND HAMPTON SUBSTATION

A second substation, designed for 900 kw, was erected at Hampton for delivering energy to the cotton mills in that place, where the switching tower for sectionalizing or switching the lines in any manner desired was also built.

The Hampton substation is of concrete, fireproof construction and is also protected by electrolytic lightning arresters and air-type choke coils. This substation was

placed in service with 10 miles of transmission line between it and Griffin in July, 1912. The entire system was placed in commercial operation on Sept. 1, 1912, and since that date has given continued satisfactory service.

A third substation of 900 kw was put in operation in November, 1912, at Monticello, together with 9 miles of 66,000-volt single-circuit wooden pole line for supplying energy to the city of Monticello and manufacturing industries located there. This building is an exact duplicate of the Hampton substation.

The towers were furnished by Milliken Brothers, Inc., of Milliken, Staten Island, N. Y. The insulators and fittings were furnished by the Ohio Brass Company of Mansfield, Ohio. The aluminum cables for the transmission line were made by the Aluminum Company of America. The station apparatus for Atlanta and Hampton was purchased from the Westinghouse Electric & Manufacturing Company, and that for Monticello from the General Electric Company. The transmission line and stations were designed and built by the company's own organization, under the direction of Mr. William H. Felton, president; Mr. T. F. Wickham, vice-president, and Mr. L. A. Magraw, chief engineer.

New Terminal Post Office in New York—III.

By L. B. Marks and J. E. Woodwell

The issues of the *Electrical World* of Jan. 11 and Jan. 18 described the electrical and mechanical equipment and the wiring and illumination of the new terminal post office in New York. In this instalment is described the equipment for heating and ventilating the building, electric and hydraulic elevators, pneumatic door-operating system and vacuum cleaning system.

Heating and Ventilation

All occupied portions of the post office building are supplied with fresh air by means of an extensive system of mechanical ventilation. The east foyer, the pavilions and the main workroom under the skylight on the first floor, as well as the east rooms and pavilions of the second and third floors, are heated by the indirect method. The remainder of the building, representing approximately 80 per cent of the total, is equipped with a hot-water direct system having forced circulation. All indirect heating is by steam. The water for the direct system is heated by steam in two vertical, closed heaters and is forced through the system by two motor-driven centrifugal pumps. There is a total of 41,000 sq. ft. of hot-water direct radiation in the building, sufficient heating surface having been provided to keep the building properly warmed independently of the requirements for ventilation.

The warming of air for ventilation is accomplished by two groups of "Vento" heaters, each group consisting of a primary and secondary heater and containing a total of 21,200 sq. ft. of steam-radiation surface. In each group a spray-head air washer is located between the primary and secondary heaters. Water for the air-washer sprays is furnished by two motor-driven centrifugal pumps.

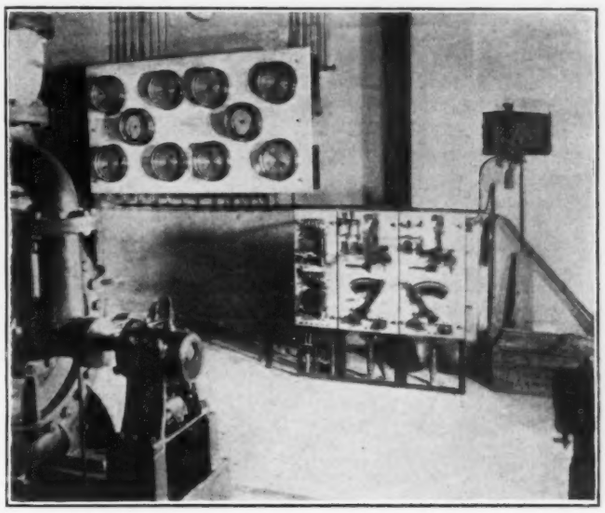


FIG. 2—GAGE BOARD AND AUTOMATIC CONTROL PANELS FOR PUMPS

Fresh air is drawn into two vertical shafts through adjacent court windows on the second, third and attic floor levels. From there it is led through the heaters and air-washers and forced through the distributing airways by means of four 200-in. full-housing steel-plate double-inlet fans, two for each group of heaters. A total quantity of 300,000 cu. ft. of air per minute is handled by these fans. The supply of steam to the primary and secondary heaters is under thermostatic control, the final temperature of the air delivered for ventilation being 70 deg. Fahr.

This air is distributed by means of sheet-metal airways and through four principal uptakes. From these uptakes

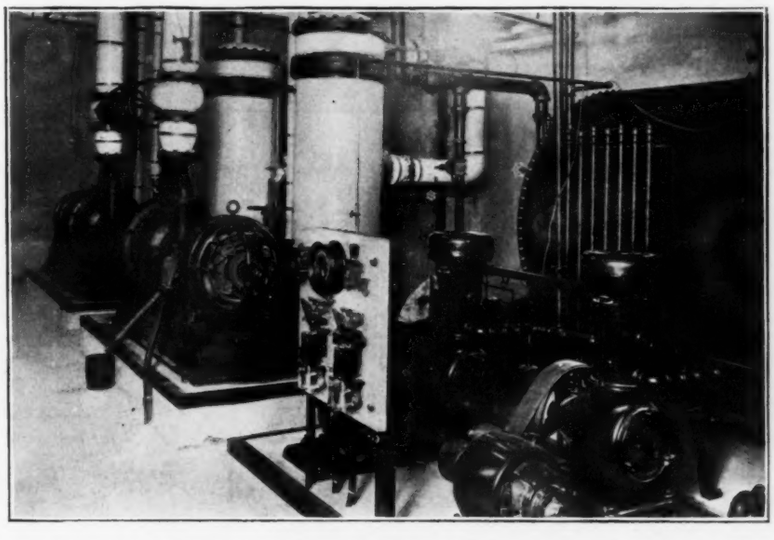


FIG. 1—PUMP ROOM, SHOWING HOT-WATER HEATERS AND CIRCULATING PUMPS, THERMOSTATIC-CONTROL APPARATUS, ETC.

FIG. 3—ONE OF TWO 45-HP, 200-IN. MOTOR-DRIVEN BLOWERS SUPPLYING BUILDING VENTILATION, 300,000 CU. FT. AIR PER MINUTE

trunkways are carried in or at the ceilings of the several floors, with run-outs to the various sections and rooms of the building. All of these airways, except the vertical uptakes, are of sheet metal.

For indirect heating 124,000 cu. ft. of air per minute is taken from the quantity supplied by the four main fans and reheated by tertiary heaters having a total of 5600 sq. ft. of radiation, divided as follows: One heater for the first-floor foyer and pavilions; fifteen heaters for the main workroom under the court skylight on the first floor, and two heaters through which air is drawn by two 90-in. full-housing steel-plate fans to be forced to the second-floor and third-floor east rooms and pavilions.

The supply of steam to the tertiary heaters for the first floor is controlled by thermostats located on the same level. Thermostats located in each fan-discharge line control the admission of steam to the tertiary heaters for the east rooms and pavilions of the second and third floors.

The discharge of air from the building is effected entirely by fans. Air is removed from the basement by one double-inlet multi-blade fan, having a 42-in. wheel, and by two 160-in. full-housing steel-plate double-inlet fans. Air from the east foyer is discharged by a 48-in. propeller fan into the basement adjacent to the two steel-plate fans which discharge outboard. Air from the main workroom on the first floor is discharged outboard by four 66-in. propeller fans located in the monitor, being passed through the space between the upper and lower glasses of the skylight.

Throughout the remainder of the building the air is conducted to the super-attic by metal flues located in the exterior and court walls, and from there is discharged through the roof by two 24-in. multi-blade fans and four duplex sets of 66-in. propeller fans.

Complete and independent seat ventilation is provided for all toilet rooms. The system comprises round sheet-metal piping with soldered joints, connected to four independent multi-blade fans, which are located in the super-attic and discharge outboard through the roof.

An electric tele-thermometer system is also provided in the building, being so arranged that by shifting a switch the operating engineer can at once determine the temperature in various chambers and airways of the ventilating system and in typical rooms throughout the building, besides measuring the temperature of the supply and return of the hot-water system.

The motive power required in connection with the entire heating and ventilating equipment is furnished by electric motors. The controllers of practically all these motors are arranged for obtaining a speed variation of about 15 per cent above normal.

A schedule of the motors required to drive the heating and ventilating apparatus is given in Table I.

TABLE I—SCHEDULE OF MOTORS FOR HEATING AND VENTILATING APPARATUS

Apparatus	DIRECT-CURRENT, 240-VOLT MOTORS							Make	Service
	Hp.	Speed			Efficiencies				
		Max.	Normal	Min.	Full-Load	Three-fourths Load	One-half Load		
200-in. blower	45	136	119	90	83	82½	80½	Garwood	Main air supply
200-in. blower	45	136	119	90	83	82½	80½	Garwood	Main air supply
160-in. blower	12	170	150	112	75½	75½	72	Garwood	Basement exhaust
160-in. blower	8	170	150	112	75	74	71	Garwood	Basement exhaust
90-in. blower	3	300	260	195	80	78	73	Garwood	East front—second and third floors
90-in. blower	3	300	260	195	80	78	73	Gardwoo	East front—second and third floors
66-in. propeller fan	3	175	152	115	80	78	73	Garwood	Exhaust through
66-in. propeller fan	3	175	152	115	80	78	73	Garwood	Skylight
66-in. propeller fan	3	175	152	115	80	78	73	Garwood	From first-floor workroom
66-in. propeller fan	3	175	152	115	80	78	73	Garwood	From first-floor workroom
48-in. propeller fan	2	400	350	262	80	78	73	Garwood	Exhaust east foyer—first floor
Two 66-in. propeller fans	5	240	200	150	75	74	71	Garwood	Main exhaust from super-attic
Two 66-in. propeller fans	5	240	200	150	75	74	71	Garwood	Main exhaust from super-attic
Two 66-in. propeller fans	5	240	200	150	75	74	71	Garwood	Main exhaust from super-attic
Two 66-in. propeller fans	5	240	200	150	75	74	71	Garwood	Main exhaust from super-attic
42-in. multivane fan	5	....	240	....	76	74½	71	Garwood	Rear basement exhaust
15-in. multivane fan	0.125	....	425	....	80	78	73	Garwood	Exhaust locker room, basement; 120-volt motor
15-in. multivane fan	0.7	....	900	....	80	78	73	Garwood	Exhaust for toilet; local ventilation
15-in. multivane fan	0.92	....	975	....	80	78	73	Garwood	Exhaust for toilet; local ventilation
15-in. multivane fan	0.82	....	950	....	80	78	73	Garwood	Exhaust for toilet; local ventilation
15-in. multivane fan	1.00	....	750	....	80	78	73	Garwood	Exhaust for toilet; local ventilation
24-in. multivane fan	1.00	....	400	....	80	78	73	Garwood	Exhaust, northeast pavilion, second and third floors
24-in. multivane fan	1.00	....	400	....	80	78	73	Garwood	Exhaust, southeast pavilion, second and third floors
Multivane fan	.125	....	600	....	..	....	....	.....	Exhaust for ejector pit
5-in. turbine pump	10.0	750	650	490	..	78	75	Garwood	Circulation hot water
5-in. turbine pump	10.0	750	650	490	9	78	75	Garwood	Direct-heating system
2-in. volute pump	2.0	....	1200	....	80	78	73	Garwood	Return condensation to boiler plant
2-in. volute pump	2.0	....	1200	....	80	78	73	Garwood	Return condensation to boiler plant
1½-in. centrifugal pump	0.5	....	1080	....	80	78	73	Garwood	Expansion tank supply
6-in. volute pump	15	650	570	430	85	83	79	Economy	Circulation of water for air washers
6-in. volute pump	15	650	570	430	85	83	79	Economy	Circulation of water for air washers
2-in. volute pump	2.0	....	1200	....	80	78	73	Economy	Drainage, south air-washer, steam and hot-water systems
2-in. volute pump	2.0	....	1200	....	80	78	73	Economy	Drainage, north air-washer
3½-in. by 4-in. air compressor	1.5	....	1700	....	....	....	....	Westinghouse	Air supply for thermostatic system valve and damper control
3½-in. by 4-in. air compressor	1.5	....	1700	....	....	....	....	Westinghouse	Air supply for thermostatic system valve and damper control

Elevator Service

The elevator equipment of the post office building includes twenty electric worm-gear traction elevators and four direct-acting hydraulic-plunger elevators. The plunger elevators travel from the first floor and basement of the post office structure down to the train platforms of the Pennsylvania Railroad utilized for the receipt and dispatch of mail. These elevators are used as auxiliaries to the mail-handling apparatus previously described. The hydraulic service for their operation is obtained from the

plant serving the Pennsylvania Terminal Company, which maintains and operates these elevators.

The elevator service for the superstructure of the post office building includes five passenger cars, fourteen combination passenger and freight cars and one freight car. All elevator machines are of the latest duplex-worm traction type. A schedule of the elevator data is given in Table II.

TABLE II—ELEVATORS

	ELEVATOR NUMBERS											
	1, 2, 5, 6	3	4	7, 19, 20	15	8	10, 11, 13, 14, 16, 17	12	23	24	9, 18	21, 22
Type	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Hydraulic	Hydraul.
Service	Passenger	Passenger and freight	Passenger	Passenger and freight	Passenger and freight	Passenger and freight, safe lift	Passenger and freight	Freight	Passenger and freight	Passenger and freight	Freight	Freight
Car size	5 ft. 10 in. by 7 ft. 1 in.	6 ft. 5 in. by 7 ft. 4 in.	5 ft. 2 in. by 6 ft. 2 in.	5 ft. 8 in. by 7 ft. 9 in.	5 ft. 8 in. by 7 ft. 9 in.	5 ft. 8 in. by 7 ft. 9 in.	5 ft. 8 in. by 7 ft. 9 in.	6 ft. 0 in. by 15 ft. 1 in.	5 ft. 3½ in. by 6 ft. 2 in.	5 ft. 0 in. by 6 ft. 2 in.	6 ft. 0 in. by 15 ft. 0 in.	6 ft. 0 in. by 15 ft. 0 in
Normal capacity, lb., exclusive of car	3250	4200	2500	4750	4750	4750	5000	7500	3000	3000	7500	7500
Maximum capacity, lb., exclusive of car	3800	5000	3000	5500	5500	6500	5500	8000	3600	3600	9000	9000
Normal speed, ft. per minute, up or down	300	200	250	150	200	200	100	100	200	300	120	100
Motor, hp	35	35	16	35	35	35	25	30	24	30	.....	.....
Motor, r.p.m.	800	800	800	800	800	800	690	460	800	800	.....	.....
Total car travel	65 ft. 3 in.	37 ft. 9½ in.	19 ft. 9½ in.	86 ft. 9½ in.	86 ft. 9½ in.	86 ft. 9½ in.	19 ft. 9½ in.	19 ft. 9½ in.	32 ft.	50 ft.	74 ft. 4 in.	32 ft. 2 in.

Owing to the complicated nature of the framework and the restricted headroom over the several elevator shafts difficulty was found in many cases in securing a suitable arrangement of apparatus without complication of sheaves and idlers. In some instances it proved to be impossible to place the machines over the shafts, and in nearly all cases special framing supports were required. In order to install certain of the freight-elevator machines, it was necessary to provide trap doors in the roof of the super-attic to permit original assembly of the machines and future repairs to the installation.

Since the tracks and platforms of the Pennsylvania Railroad extend under the post office building, all the elevator pits were made up of heavy reinforced construction, with water-tight sheet-steel pans. These pans were specially framed to receive the spring-return oil buffers provided for both the cars and the counterweights belonging to the elevators.

The elevators are equipped with the latest type of magnetic control, arranged with solenoid-actuated switches. All controlling apparatus is mounted on 1.5-in. blue Vermont marble slabs. Each car is provided with a controller switch and supplementary car emergency switch. All motors are of special design to carry temporary overloads of at least 50 per cent.

A typical curve of motor efficiency obtained by actual test is shown in Fig. 6. The guaranteed efficiencies for all motors are: For full load, 89 per cent; for three-quarters load, 87 per cent, and for half load, 83 per cent.

All cars as well as counterweights are provided with centrifugal-governor and guide-grip safety devices, the governors being electrically connected so as to operate the controlling circuit and main brake before affecting operation of the guide grips.

Each elevator is, in addition, provided with three limit-stop switches, located in the shafts at both the upper and lower travel limits of the car. These switches are mechanically operated by contact with the car and are electrically connected with the controlling apparatus so that the first and second switches when engaged by the car perform the same function as the car-control switch in the event of the operator failing to operate the car switch properly. The third switch, if engaged, opens the main-line circuit through the circuit-breaker and applies the main brake.

All elevators are equipped with special low-carbon steel cables for traction-elevator service, capable of carrying a working load of 20,000 lb. per ⅝-in. cable and 27,000 lb. per ¾-in. cable.

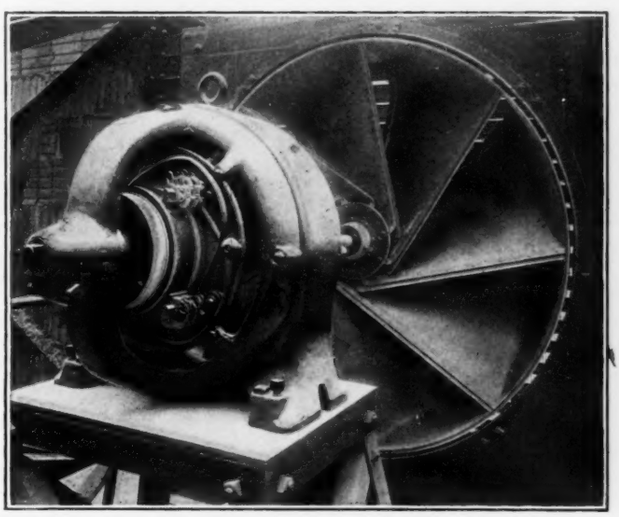


FIG. 4—EXHAUST FAN IN GENERAL WORKROOM

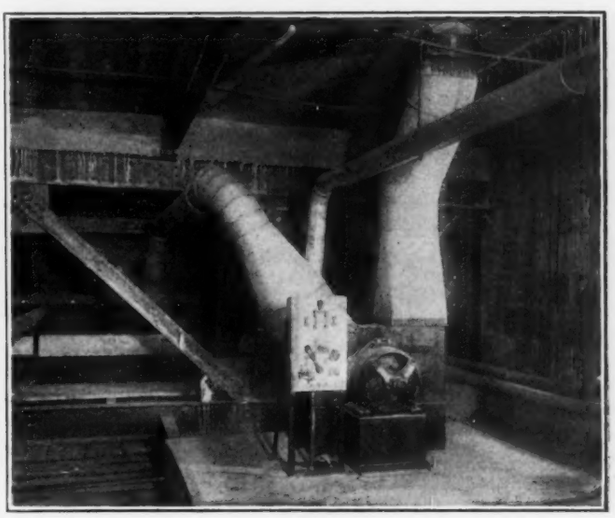


FIG. 5—EXHAUST SET FOR LOCAL VENTILATION OF TOILETS

Owing to the limited space in certain shafts for elevators operated in pairs, it was necessary to provide special vertical framing and supports extending the entire length of the shaft for attaching the car center guides and counterweight guides.

On account of the heavy trucking service for the combination passenger and freight elevators, the cars are constructed with ¼-in. sheet-steel wainscot to a height of 4 ft., and the floors are of 2.5-in. tongue-and-grooved maple flooring.

The passenger cars and the combination passenger and freight cars, having the full travel from the basement to the attic, are equipped with a signal system, including an external signal lamp over each entrance door, in conjunction with hotel-type car annunciator signals. These latter consist of a double row of miniature lamps corresponding to the several floors which the car serves, one row representing the upward movement of the elevator and the other the downward travel. The wiring is arranged so that pressing the "up" or "down" button on any landing causes the external lamp at that landing and the corresponding miniature lamp in the car annunciator box to be lighted, the lamps remaining lighted until the call is answered.

The short-rise elevators having a travel of more than one floor are equipped with standard drop-signal annunciators, while cars having a travel of only one floor are provided with call-bell signal.

All signal apparatus is operated from a low-voltage system receiving energy from a number of motor-generator sets.

The various safety devices on the elevators have been put to a thorough test and have been found to meet every requirement.

Pneumatic Door-Operating System

Past experience in various post office buildings has demonstrated the necessity of installing heavy steel doors leading to the various elevator shafts and passageways used for trucking service. On account of the size of the openings required some of these steel doors weigh as much as 1000 lb. each in the case of a single-section door, or 500 lb. each for a double-section door. As it would be impracticable to operate these doors rapidly by means of a hand-operated mechanical device, it was found necessary to provide an automatic mechanism worked by compressed air.

The total number of doors thus operated at the various elevator shafts, vestibules and passageways throughout the building is seventy-four. The mechanism for the doors comprises pairs of air engines consisting of cylinders with pistons connected to the counterweighted doors by steel cables running over sheaves. These cylinders are fitted with the necessary air supply and exhaust connections, and are designed to secure an air-cushioning effect at the end of the stroke in opening or closing. The air-supply valves for these cylinders are actuated by levers, which, in the case of the elevator car doors, are engaged by the car when approaching and leaving the landing. The car is also equipped with a hand lever by which the operator can open and close the doors as desired. This mechanism is so arranged that the shaft doors will automatically close when the car leaves the landing Doors to the various passageways and vestibules are operated by hand levers from both sides of the doors.

Compressed air for operating the doors is furnished by two National two-cylinder, 6 in. by 8.5 in., single-stage, water-jacketed, motor-driven air compressors, each designed for compressing 82 cu. ft. of free air per minute to a pressure of 80-lb. gage. The pumps are driven by 15-hp motors running at 1200 r.p.m. The pump units are cross-connected to a supply pipe delivering into a primary pressure tank which will carry the delivery pressure of the compressors. From this the air passes through a reducing valve to a secondary pressure tank which will carry the constant air pressure required to operate the engines of the door-operating mechanism. Each compressor is equipped with an automatic controlling device designed to start one motor when the air pressure in the primary receiving tank falls to a predetermined minimum and to stop the motor when the maximum receiving pressure has been obtained. Should one compressor, however, not be sufficient to maintain the minimum pressure, the second, or auxiliary, compressor will then automatically be put into operation when the pressure has fallen about 5 lb. below the minimum, the auxiliary compressor remaining in operation until the maximum pressure has been nearly attained. The auxiliary compressor will then be the first one to be cut out of service. The controlling apparatus is cross-connected so that either compressor may be used for regular service while the other is held in reserve as an auxiliary.

All piping is of standard galvanized iron throughout and is fitted with drip connections at all low points of the system to permit drainage of water of condensation.

According to the performance required by the contract, the continuous operation of twenty-five of the seventy-four doors, at the rate of one each minute, must be accomplished by the operation of only one of the air compressors running at normal rating. Each of the doors must open or close completely in an operating time not greater than twelve or less than eight seconds, and elevator doors shall be capable of being immediately checked or reversed by the operator, irrespective of the direction of travel of the car.

The principal data relating to the pneumatic door-operating equipment are given in Table III.

TABLE III—RESULTS OF TEST OF 8.5-IN. X 6-IN. AIR COMPRESSOR AND MOTOR

Time	Motor, 15 hp, 240 volts, 51 amp					
	Volts	Amp	Speed	Pressure, Lb. per Sq. In.	Temperatures	
7:15 A.M.	240	49.5	1193	80	Cooling water entering, 17 deg. C.	
8:15 A.M.	240	49.5	1190	80	Cooling water leaving, 44 deg. C.	
9:15 A.M.	240	49.0	1200	80	Gal. of water per hour, 34	
10:15 A.M.	240	48.5	1202	80	Surrounding air	21 deg. C. Rise
11:15 A.M.	240	48.5	1207	80	Front motor-bearing	40 deg. C. 14 deg. C.
12:15 P.M.	240	48.5	1200	80	Rear motor-bearing	39 deg. C. 18 deg. C.
1:15 P.M.	240	48.0	1208	80	Armature winding	49 deg. C. 28 deg. C.
					Commutator	54 deg. C. 33 deg. C.
					Series field	53 deg. C. 32 deg. C.
					Yoke	42 deg. C. 21 deg. C.
					Air discharge pipe	114 deg. C. 93 deg. C.

Insulation break-down test:
Armature and frame....1500 volts alternating current. Series and frame .....1500 volts alternating current.

VACUUM CLEANING SYSTEM

The vacuum cleaning system installed in the building was designed with a capacity to operate continuously eight 20-in. bare-floor renovators at one time.

To meet this requirement two 50-hp motor-driven horizontal reciprocating-type vacuum pumps are provided, each having a cylinder displacement of 1200 cu. ft. per minute. A feature of these pumps is the use of the machine base as a dust separator and collector. Air from the sweepers is led through water in the base casting before passing to the pump. The valves are of the rotary type and are so arranged that by turning them through 180 deg. the vacuum pump is converted into an air compressor. This arrangement permits the suction lines to the base to be closed off and allows the water, with the collected refuse, to be discharged directly into the sewer. The vacuum in the suction line is maintained practically uniform by means of a by-pass valve, which automatically permits the air to pass from one cylinder to the other in case the vacuum exceeds that for normal operation. Each pump is driven by an electric motor through herringbone V-shaped gears to insure practically noiseless operation.

The sweeper outlets throughout the building are so located that any point in any room may be reached with a renovator by means of a 75-ft. length of hose. No pipe smaller than 1.5-in. is used in the branches, and the pipe risers are at least 2 in. in diameter. The main suction

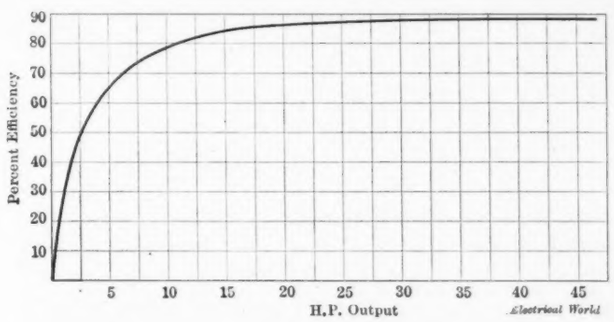


FIG. 6—EFFICIENCY CURVE OF ELEVATOR MOTOR

line in the vacuum-cleaner room enters two centrifugal dust separators, one in the line leading to each machine.

To facilitate the convenient operation of the system over such a large floor area there are provided a number of combination portable hose reels and renovator cabinets of compact design, capable of carrying full equipment of renovators and 100 ft. of non-collapsible hose. The installation is designed to maintain a vacuum of 15 in. of mercury column with all outlets closed.

The performance specifications, in addition to imposing a capacity test of the pumps, require that a mixture of 25 lb. of bolted wheat flour, 20 lb. of sand and 5 lb. of charcoal, when evenly scattered over 5000 sq. ft. of bare floor, shall be cleaned with a standard-size bare-floor cleaner at a rate of not less than 8000 sq. ft. per hour.

The plant was also required to be capable of operating at 12-in. vacuum eight bare-floor renovators of the largest size, each attached to 75 ft. of hose, with a power demand of not more than 40 kw. The two American Rotary Valve Company vacuum pumps are of the two-cylinder tandem type, each cylinder measuring 25 in. by 10 in. The pumps are capable of handling 600 cu. ft. of free air per minute from a vacuum of 12 in. of mercury. The 50-hp motor has a specified efficiency of 90 per cent at full load.

CONCLUSION

Preliminary work in connection with the planning of the mechanical and electrical equipment of the new post office building, as described herein, was begun about five years ago. The consulting engineers were called upon not only to design this equipment but to supervise its installation. The work has been continuous and is now practically completed.

A section of the building occupied by the railway mail service was placed in service over two years ago; the remaining portions will be ready for occupancy early this year.

The entire building was constructed under the direction

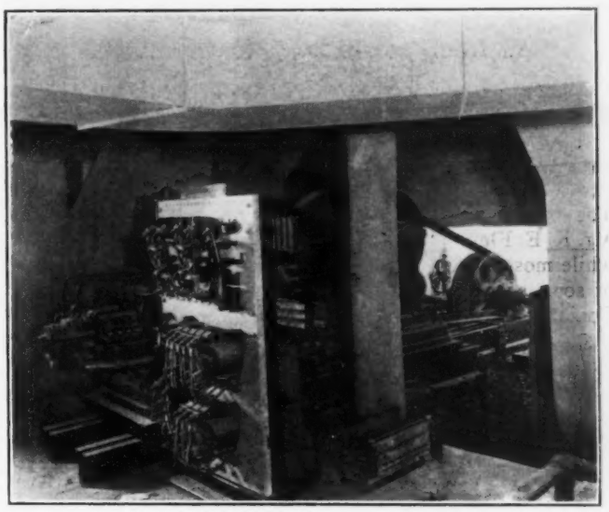


FIG. 7—PASSENGER-ELEVATOR EQUIPMENT

of the United States Treasury Department, Messrs. McKim, Mead & White acting as architects and Messrs. L. B. Marks and J. E. Woodwell, New York City, serving as consulting engineers.

The main contractors for the electrical and mechanical work are as follows: Mail-handling machinery, Lamson Consolidated Store Service Company and Otis Elevator Company; electric wiring, Van Wagoner-Linn Construction

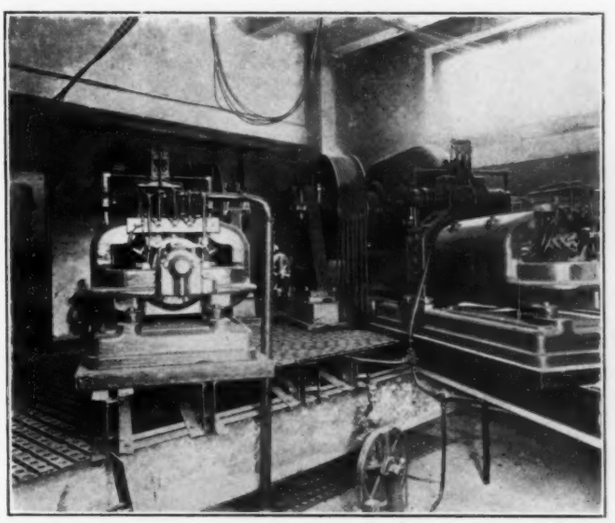


FIG. 8—TWO OF THE TWELVE WORM-GEAR-TRACTION PASSENGER-FREIGHT ELEVATORS

Company; lighting fixtures installed to date, Cassidy & Son Manufacturing Company and the Mitchell Vance Company; heating and ventilation, Baker, Smith & Company; electric elevators, Otis Elevator Company; hydraulic elevators, Standard Plunger Elevator Company; pneumatic door-operating devices, Burdett-Rowntree Manufacturing Company; vacuum cleaning machinery, American Rotary Valve Company.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

An Iron Campaign by Mail at Mobile

During a Christmas appliance campaign at Mobile, Ala., 325 electric flatirons were sold with the aid of a letter coupon sent to local customers of the Mobile Electric Company. This explained that the company would accept the letter, in lieu of $1.50, on the purchase of an electric iron. The reason assigned for granting the bonus, as given by Mr. R. E. Flower, contract agent for the company, was that, while most business firms gave away calendars or souvenirs of some sort during the holiday season, the Mobile Electric Company wished to give something of real value. The result of these letters was the sale of 325 flatirons. The irons were sold for cash only. The receipts paid not only for the irons but the cost of advertising as well.

Geared Electric Vehicle in New York-Boston Run

Completing a 251-mile run from New York to Boston in twelve hours and fifteen minutes is the record, over hilly roads with many muddy detours, just established by a Church-Field geared-type electric roadster. For a shorter distance between the two cities, 224 miles, the previous speed record for an electric vehicle had been twelve hours and twelve minutes. Detours made by the Church-Field vehicle account for the discrepancy in mileage.

The trip was made by Mr. C. R. Forth, of New York, and a companion. The car carried standard lead batteries and equipment, an extra tire casing, four tubes and 40 lb. of baggage. The hilly route followed caused the Church-Field two-speed transmission to show to advantage. The weather was cold and considerable snow was encountered, making it necessary three times to leave the main road. In spite of these difficulties, the car's average speed per hour for the distance was 21.3 miles. No trouble was encountered and no adjustments were made.

Important Electric-Vehicle Announcement in St. Louis

Now that the electric-vehicle industry in St. Louis has grown to large proportions, the Union Electric Light & Power Company of that city announces that it will withdraw from the field of selling electric vehicles and supplies and doing garage work, confining itself to its regular business of generating and selling electricity.

Early in 1906, when there were but eleven electric vehicles in St. Louis and a woeful lack of expert and intelligent attention to the subject, the central-station company began an aggressive educational campaign which included the opening of garages and taking the local representation for some well-known types of pleasure and commercial cars. Largely as the result of this policy, the use of the electric vehicle has expanded rapidly in St. Louis, until to-day it is said that there are more than 700 "electrics" in operation on the streets of that city.

The electric-service company has now decided that the time has arrived when it should withdraw from active competition with others in selling and garaging. It has therefore given up its agencies and will close its public garage at Twentieth and Locust Streets as soon as its customers can be accommodated elsewhere. The Rauch & Lang Carriage Company, which the electric-service company has represented, is about to open a garage and salesroom in the West End, and the General Vehicle Company has likewise arranged for local representation, as has the Electric Storage Battery Company, for which the Union Electric Light & Power Company has also acted as distributer.

Mr. C. E. Michel, who has been manager of the automobile department of the electric-service company and who has done much to build up the use of the electric vehicle in St. Louis, will continue in the employment of the company, and his services will be at the command of either buyers or sellers of electric vehicles when desired.

Building Up Day Load in a Town of 3800

"It was only after long consideration and the wearing out of innumerable pencils that we could finally make up our minds to attempt twenty-four-hour service, and even then it was with the expectation of having to operate several years at a loss, for we were peculiarly situated," said Mr. W. E. Haseltine in recounting before the Wisconsin Electrical Association, Jan. 15, his experiences in building up a demand for day service at Ripon, Wis., a town of 3800 inhabitants.

The place itself was hardly one to offer much encouragement for the success of a venture of this kind. Its population was largely made up of retired farmers and there were practically no manufacturing establishments. When it is understood that the community had not increased a soul in population during the last twenty years there will be little wonder that the central-station manager hesitated.

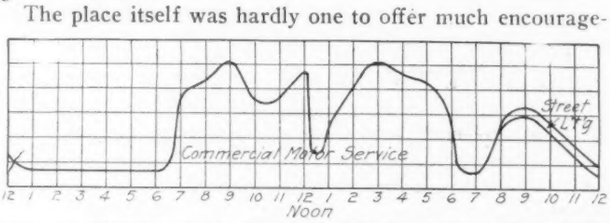


FIG. 1—STATION LOAD CURVE JUNE 27, 1912, MOONLIGHT, STREET LIGHTING REDUCED, STORES CLOSED

After arranging an attractive rate schedule, under which energy for motor service was to be sold at 9 cents, net, per kw-hr. for the first sixty hours' use, and 4.5 cents per unit thereafter, the newly formed commercial department went in search of "power" customers. Going over the entire town, a list was made up of everyone who could possibly use motor service—it was an extremely short one—together with the number of horse-power in motors and the various motor-driven equipment thought to be required by each. The local staff was entirely without experience in motor practice, but made the best guesses it could, Mr. Haseltine modestly admits. Then followed a round of visits to persons on the calling list, explaining what it was intended to do and the advantages of electric power. Meanwhile strong arguments were used to get prospective customers to agree to patronize the company if day service were given. It was discouraging work, however. Some said positively that they would not use it; a number thought they would like it, but had various reasons for putting it

off; this man would not put in a motor until he could sell his gasoline engine; another couldn't afford it just now. but the majority wanted to wait and see how the other fellow came out.

Not content with one call, the visits were repeated several times, but as the net result of several weeks' effort there had not been landed a single one of the larger "pros-

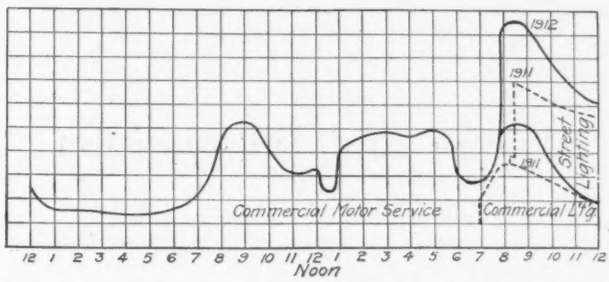


FIG. 2—JULY 6, 1912, STORES OPEN, LARGE FACTORY SHUT DOWN

pects," while the only customers positively booked were a meat market and a couple of printing offices. Almost ready to give up, the local sales staff, in the depths of its despair, remembered the rabbit that climbed the tree "because he *had to!*" With this inspiring example in mind the solicitors sallied forth again, having determined that this time they *must* get the business.

The first establishment tackled in this spirit was a creamery—a bad beginning on account of the large amount of steam necessarily used. In previous talks the creamery manager had declared that he would like to use electricity if it cost the same as steam or even a trifle more, but he seemed perfectly confident that "it couldn't be done." Besides, he had been actually convinced that he was getting his heat free. This creamery man was no exception, and, to make a long story short, he finally accepted the proposition that the electric company should lay out his installation of motors—their number, size and location—and that it would itself guarantee his satisfaction with the results. If dissatisfied, after a fair trial, the company even agreed to take out the motors without it having cost the customer a cent.

The creamery was then being driven by a single engine and two long parallel line-shafts. Individual motor drives were decided upon for the entire equipment, the total motor horse-power installed being about one-third that of the engine. After the plant had been running a month or six weeks the manager was approached and asked how he was satisfied. He replied that he liked the way the installation worked, but still believed that it was costing him more money than steam drive.

The company then suggested a two weeks' test, arranging to operate one week with steam and the next with elec-

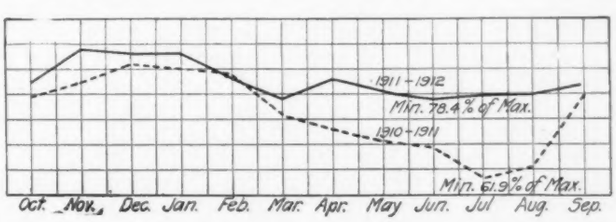


FIG. 3—COMPARISON OF STATION RATE LOADS, 1911 AND 1912

tricity. It was then winter, and during the week of steam operation the exhaust steam was used for heating the building, but in spite of this, the end of the test showed a substantial saving in favor of electricity. The company has been furnishing this customer's service ever since, and during the past summer he put in a motor-driven refrigerating plant. This installation was of incalculable benefit in giving both prospective customers and the central station confidence in its product, and it proved of the greatest value as an example for securing other business.

The next problem was a washing-machine factory operated by steam. Here the manager was willing to put in motors for summer use, but "knew" that he could save money by operating by steam in the winter and using his exhaust steam for heating. He "knew" it because a friend of his who ran a machine shop in a neighboring city had told him so. Upon investigation it was found that this friend operated his extensive machine shop with one large motor and innumerable belts and line shafts.

The manager was, however, finally persuaded to permit motors to be installed in the fall, the argument being made that if his exhaust steam didn't save him anything in winter he was that much ahead in operating continuously by electricity. Here again individual drive was installed and on test won out well under the cost of steam. This firm is now building a new factory, which will be equipped with motor drive exclusively.

Other motor-service consumers came gradually—not without effort; but each installation helped the next—a steam laundry, a quarry, shops, garages, etc. Meanwhile the company was not idle with small heating devices. The management first picked out what it considered to be the best electric iron in the market, regardless of cost (for one has to live with an electrical device after it is installed), bought a quantity and proceeded to distribute them among the consumers. With each iron was sent a little folder offering a thirty-day free trial. If the customer

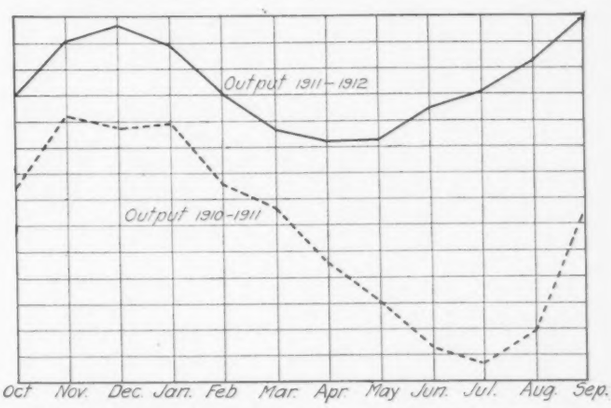


FIG. 4—COMPARATIVE STATION OUTPUTS, 1911 AND 1912

did not request that the iron be taken back at the end of this time, the company assumed he desired to retain it and billed it at net cost of $3.75, the regular price being $5.

A rather unfortunate time was selected for sending out this first consignment of irons, for it was October, with its lengthening days, and the company having just started twenty-four-hour service, people were already using service at hours to which they had never been accustomed before. These were two good reasons for expecting increased bills even without the irons, and since no very great success was anticipated the management was more than pleased when about 60 per cent were retained.

Next spring, when the irons were sent around again, a still larger percentage was retained. A little later the same plan was carried out with toasters, except that these were sold for list. While not as large a number of them were placed as in the case of the irons, more were put into service in this way than could have been done in any other. The three best-selling heating appliances in their order have been irons, toasters and warming pads.

Last summer was the first one with fan service available, but the results were not very satisfactory, due, perhaps, to the fact that the summer was exceptionally cool.

Meanwhile the company was advertising in various ways,

by circulars, newspapers, bill stickers, etc., and during the month of April a special thirty-day wiring offer for residences was made—$1 per outlet for the first six outlets and 75 cents for each one over six. Fixtures were also sold during this period at reduced rates. Altogether the results broke a little better than even on these installations, and quite a number took advantage of this offer.

The local washing-machine company had planned to erect a new factory building and had received a number of offers to move elsewhere, but the owners, being Ripon men, preferred not to do so. After a conference of the local commercial club the factory owners suggested that a purchase of a hundred electric washers would please them greatly and would be good advertising for their company. In a few days the Ripon citizens had subscribed for these hundred machines, and when all were delivered 60 per cent of the local domestic consumers were equipped with these useful devices.

The accompanying curves show the effect of the first year of continuous service on the character of the station load. Fig. 1, taken June 27, shows the day peak to be considerably higher than the lighting peak. The stores closed at 6 p. m., as they do every day except Saturday during the summer, and, there being moonlight, there was little street lighting.

Fig. 2, July 6, shows the motor load not quite so high, since the washing-machine factory was not running. Here the commercial lighting peak and the motor peak are practically the same, the day being Saturday, when the stores were open. Superposed upon this commercial-lighting load, however, is the street lighting, bringing the total peak very much higher. Also indicated on this chart in dotted lines is the load curve for a corresponding day in 1911, showing the contrast.

Fig. 3 shows the peak-load curves for the respective years ended Oct. 1, 1911, and Oct. 1, 1912, these dates being selected since twenty-four-hour service was begun, Sept. 13, 1911. It will be noticed that last year's curve has flattened out considerably over that of the year before, the minimum being 78.4 per cent of the maximum, while for the previous year the minimum was 61.9 per cent.

Fig. 4 shows the comparative station outputs in kilowatt-hours, indicating perhaps best of all how the hollow due to the short lighting hours of the daylight months has been filled up.

For the year 1910-11 the minimum monthly output was 33 per cent of the maximum, while for the years 1911-12 it was 73.8 per cent. Even the minimum for 1911-12 was almost as great as the maximum for the previous year. The curves of income for the two years follow in a general way the output curves, except that the difference is not quite so great, since a large part of the summer load was in motors, taking a lower rate than the lighting. The equipment is also being operated to much better use, for while the increase in peak load shown on the charts is but 4 per cent, the station output in kilowatt-hours for the year increased 57 per cent and the gross revenue 40 per cent.

The greatest surprise of all, however, was the increase of both domestic and commercial lighting loads due to service being available at all times. In fact, the average increase in revenue per consumer was 11.6 per cent for commercial customers and 13.7 per cent for domestic users. When to that is added the income from new lighting consumers, the total from this source is 77.7 per cent of the entire additional cost of the continuous service.

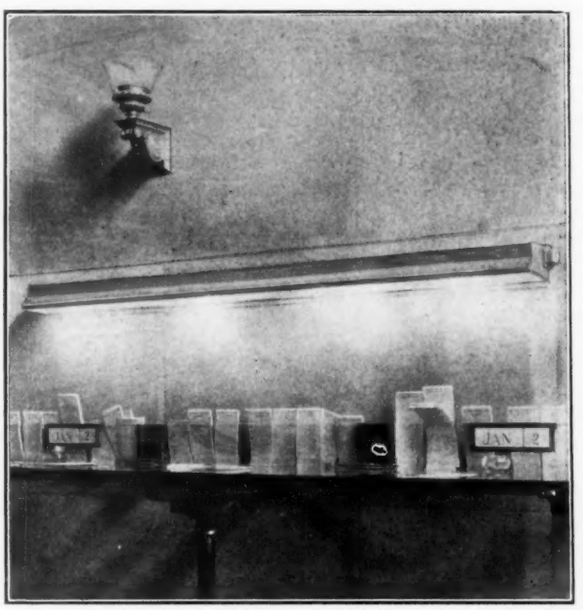
Returning to a discussion of the best methods of getting new business, nothing, said the author, can take the place of personal solicitation. Next to that Mr. Haseltine recommended newspaper advertising, especially "locals" in small-town papers. Personal items to the effect that John Jones has just equipped his house with electricity or that Richard Smith has discarded his gasoline engine in favor of an electric motor at his garage are read with interest by all of Jones' and Smith's friends, which usually include the whole population. Office displays help, too. People see them when they come in to pay their bills.

In closing his paper, Mr. Haseltine addressed pointed advice to all small-company managers hesitating at the thought of day service: "Do not be afraid of it! Results will not come by themselves, of course, nor will they in anything else worth doing, but I know of no department of public-utility service where the same amount of effort will reap a richer reward."

Wiring and Illumination

Effective Lighting of a Bank Counter

A feature of the north addition to the First National Bank of Boston, Mass., is the method of lighting the glass counters used by depositors in filling out slips, indorsing checks and making other memoranda. The bank employs Boston Edison service throughout for both lighting and motors and is a large user of electricity. A typical counter is shown in the accompanying illustration. The top surface is mounted 3 ft. 4 in. above the floor, its width being 23 in. and its thickness in solid plate 1.25 in. A glass rack 4 in.



FIRST NATIONAL BANK, BOSTON—COUNTER LIGHTING

high is fixed at the rear for holding slips and blanks. The lighting is provided by four 25-watt, 28-volt tubular tungsten lamps wired in series and placed inside a metal reflecting trough 3 ft. long, 4 in. wide at the top and 3½ in. deep, the bottom width being 5 in. The reflecting surface is lined with glass prismatic mirrors, and the lamps, which are concealed from the eyes of persons using the desk, are installed on horizontal axes 20 in. above the counter. The latter is 4 ft. 2 in. long, and the lamps are installed 18 in. between centers, each filament being centrally supported in a glass tube 10 in. long and 1 in. in diameter. The exterior of the reflector is painted gray to harmonize with the surrounding stone wall of the banking room. Entire absence of glare is a noteworthy feature of this installation. With an expenditure of only 100 watts inside the reflector, a lighting effect quite beyond the scope of the old style of carbon bulb lamps is produced, and although it is difficult to show the results of the installation in a photograph, the illumination is thoroughly soft and pleasing.

Bell and Lamp Signal Systems—II.

By Sydney F. Walker

In the issue of the *Electrical World* of Jan. 18 the first instalment of "Bell and Lamp Signal Systems" appeared, giving a résumé of the early growth and development of the use of electricity in mine signaling. In the present issue are described some of the systems used in the well-known collieries of England.

With the development of mines over large areas, in consequence of the improvements that have taken place in mining methods during the last thirty or forty years, enormous changes have also been made in the haulage systems. In the early days of British mining, when the seams utilized were at small depth below the surface and when the areas worked were small, the haulage problems were very simple. As the depth of the seams increased, it became necessary to draw from larger and larger areas, and hence the haulage roads became longer and longer. The practice of sinking the shafts at the highest part of the seam, which is very frequently at a steep angle with the horizontal, and driving the roads from the shafts to the edge of the boundary, increased the length of the roads and increased the work which the haulage systems had to perform. Gradually the simple haulage rope with one drum was displaced by the main and tail haulage system, in which a train of mine cars was drawn from the neighborhood of the working face to the engine room; and later on this system gave place to the one that is very largely used in all extensive mines now, namely, the endless-rope system.

In most large mines there are one or two main haulage roads, made wide enough to accommodate two sets of mine rails and two sets of cars. An endless rope is continually in motion on these roads, one part of the rope moving toward the coal face and the other part moving toward the mine shaft. The main haulage rope is being continually fed from what are termed secondary haulage roads, which are branch roads leading away from the main road to the working face. At first the cars on the branch roads were pulled entirely by horses; in later years they have been operated by haulage ropes, and in a great many cases the secondary haulage systems are driven by electric motors. The arrangement of endless rope haulage provides for mine wagons being attached to the rope at any point of the road, so that one rope is being continually fed with full wagons from the branch roads, and at the same time working faces are being continually supplied with empty wagons from the other rope.

It will easily be understood that it is of great importance to the men who are employed in attaching and detaching the mine wagons from the endless rope to be able to stop the rope quickly in case of accident. It frequently happens that a mine wagon is not properly on the rails, or it is jerked off the rails when the haulage rope exerts its first pull. In such a case, unless the rope is promptly stopped considerable damage may be done on the road. This requirement is met by the above-mentioned signals; but there is another requirement, namely, that those who are employed on the road should know when the rope is stopped by signal and when it is going to start again. Stopping is, of course, void of danger, but if the rope is restarted when some of the men at the ends of the branch roads are attaching cars to it, or are doing anything else that brings them in contact with the rope, its sudden starting might

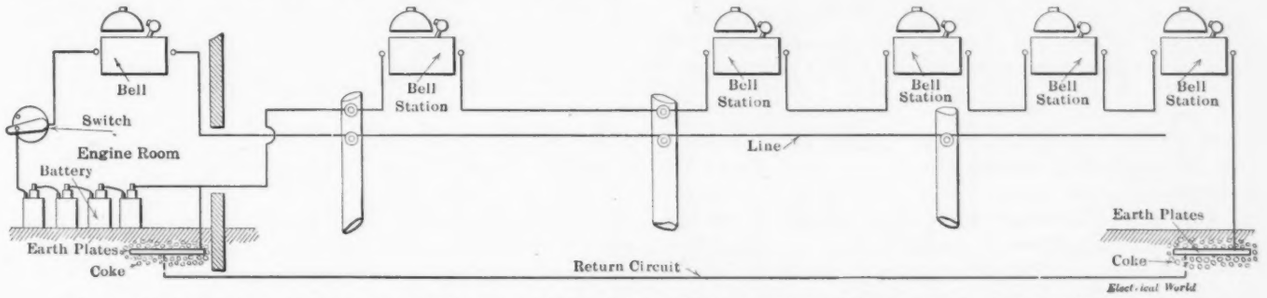


FIG. 4—CONNECTIONS OF THE OLD FORM OF ENGINE ROAD SIGNAL, WITH SEVERAL BELLS, ALL RINGING TOGETHER

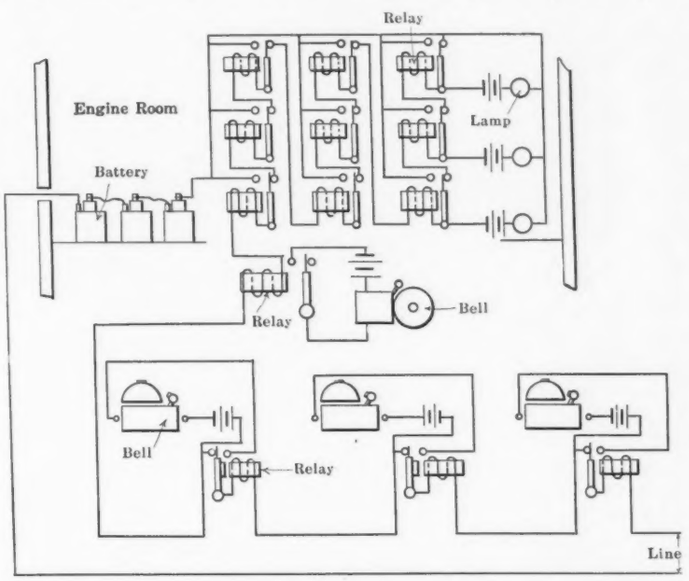


FIG. 5—DIAGRAM OF CONNECTIONS OF RELAY SYSTEM USED IN THE WILLIS METHOD

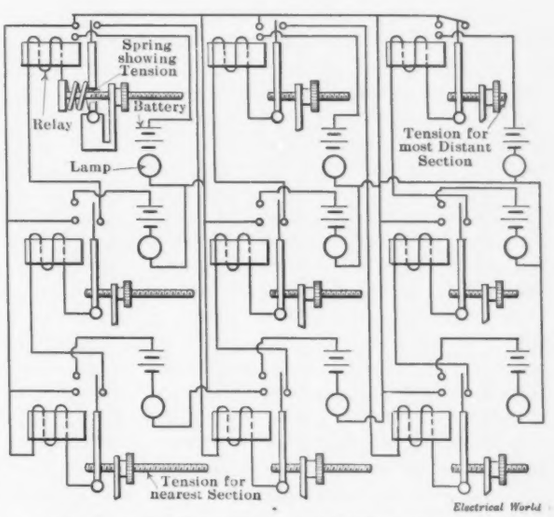


FIG. 6—CONNECTIONS OF INDICATOR OF WILLIS RELAY SIGNAL

have a disastrous result. To meet this condition bells are installed at the ends of the branch roads, as shown in Fig. 4, and all the bells ring simultaneously when any one of the men employed in hitching the cars on to the rope signals. In practice a "hitcher" would signal to stop, and when his car is ready or he has overcome the trouble, whatever it may have been, he would give another signal to start.

In many collieries it was the usual arrangement for the man who stopped the rope to signal his number, showing where the trouble had occurred in case any assistance was required. Various difficulties arose in connection with this system, though it is still in use in a great many mines, and these troubles have led to modern developments. In the first place, the engine man did not know, unless the man who stopped the engine signaled his number, where the trouble was. In the second place, the sending of a number of signals occupied considerable time. If there were six stations on a main haulage road and the ordinary signals required three or four rings, the number of rings in the station signals must of necessity be high and have occupied considerable time. More trouble was caused by the inability of the listener to distinguish separate rings with the style of bell generally used in the collieries, especially after the battery had been exhausted by sending a long series of signals.

These troubles led to the development of the modern "relay signal." The first of these was introduced some years ago by Mr. Willis at the Lycett Collieries in North Staffordshire. He divided the road into sections of equal or unequal length, according to convenience. One bell was placed in the engine room and one at each station. There was also an indicator in the station which showed the section from which the signal came. The indicator, which was of the ordinary type employed in domestic work, although somewhat stronger than usual in construction, was operated by relays, and the relays were "tuned" to respond only to the current from the section to which they were allotted. Fig. 5 shows the arrangement of the bell stations, wire and indicator, and Fig. 6 shows the arrangement of relays and indicator. Between each two sections on the engine road was installed a relay, which performed the double office of connecting a local bell and battery and of adding resistance to the circuit when the naked iron wires were connected beyond it. By arranging the sensitiveness of the relays in the engine room to correspond with the current that existed in the circuit from the different sections, the current being weaker for the relays which are toward the end of the line, the necessary selection was obtained. In addition, the relay in the engine room performed the double duty of connecting its own indicator and of cutting out all those behind it. Thus, No. 1 indicator, arranged to correspond to a connection made in No. 1 section, required the strongest current to operate it. No. 2 required less current and soon passed when connection was made in No. 3 section, and so on, No. 6 relay in the engine room operating on the smallest current. In practice, when No. 6 section signaled No. 6 relay in the engine room operated and cut out all the other relays 1 to 5, and if No. 4 section signaled No. 4 relay operated and cut out all the others, and so on. The Willis signal, so far as the writer is aware, has not been adopted elsewhere.

Quite recently there have been further developments in this direction, and some of the Yorkshire collieries, notably the Ackton Hall Colliery, have adopted what is practically a modification of Mr. Willis' signal. Fig. 7 represents the arrangement of the signals at Ackton Hall Colliery, in which important improvements have been made over the Willis system. In the first place, the indicator in the engine room consists of a series of small incandescent lamps, the current for which is furnished by a small storage battery. After a signal the lamp remains lighted until the engine man extinguishes it by switching off the battery current. There is a system of relays in the engine room, placed inside a substantial iron case. There is one relay for each section of the engine road, and when a signal is sent from any one section a bell in the engine room rings and the lamp corresponding to that section is lighted. There are only two line wires on the engine road, and there is a relay between each two sections, the relay again performing the double office of adding resistance to the line and of connecting a local bell into the circuit. A separate relay in the engine room rings the bell. The coils on all the relays in the engine room are connected in series, and the selection is performed by practically the same operation of "tuning" as that described in connection with Mr. Willis' signal.

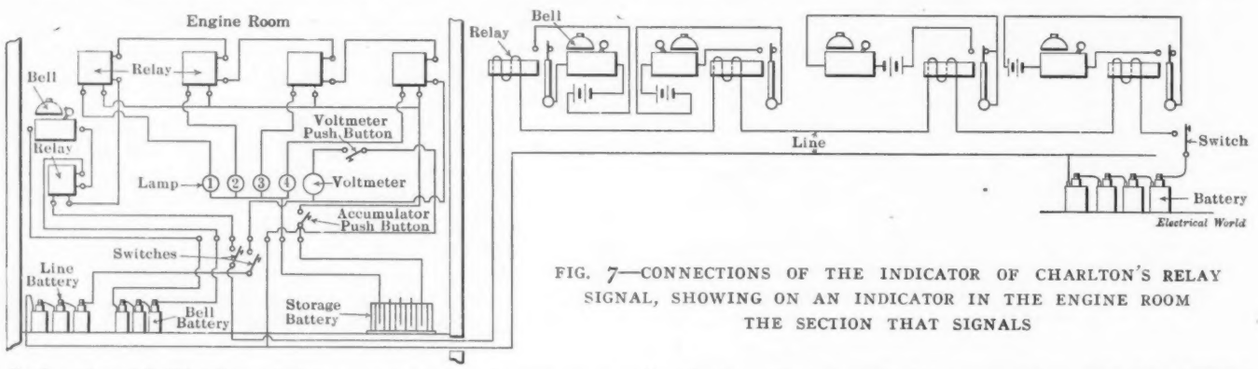


FIG. 7—CONNECTIONS OF THE INDICATOR OF CHARLTON'S RELAY SIGNAL, SHOWING ON AN INDICATOR IN THE ENGINE ROOM THE SECTION THAT SIGNALS

Assuming that there are six sections and numbering them from 1 to 6, No. 1 being that nearest the engine room, No. 1 relay requires the largest current to operate it, No. 2 a little less, No. 3 still less, and so on. The relays are carefully made and calibrated, so that at the colliery in question the line between sections 1 and 3 has a resistance of 10 ohms, that between sections 2 and 3 a resistance of 20 ohms, and so on.

There is another feature in connection with the system in operation at Ackton Hall, namely, the arrangement of the line batteries. At each end of the engine room there are two Edison Lalande batteries of twelve cells each, and they are connected in parallel, but the connections of the two line wires, the line relays and the relays in the engine room are such that there is a closed circuit, with two batteries opposing each other, and therefore when no signal is being given no current is present in the circuit. When connection is made between the two line wires in any section, the batteries are placed in parallel, operating the relays in the engine room and the relays on the line between them. The relays on the line ring the local bells, with local batteries. A feature of this system lies in the fact that the batteries are maintained at a constant potential throughout their life by means of variable resistance and voltmeter in the circuit. The life of the batteries is stated as three weeks. It will be noted that in the latest development of the sectional relay signal the Edison Lalande battery has been employed, because it is possible to maintain a constant potential on the line by its use with the aid of a resistance. From information received from the mine the indi-

cations are that the constancy of potential of the Edison Lalande battery, under the conditions ruling, is greater than that of a storage battery. It would be possible for a storage battery, for instance, to maintain constant potential only in case somewhat frequent adjustments are made during the day. In a busy mine the employees do not have time to make frequent adjustments. One adjustment per day, after the work is done, or before it commences, is as much as can be expected from them. One adjustment per week at the week-end would be better. The Edison Lalande cell fulfils the first conditions at any rate; in the experience of colliery operation the average storage battery does not. There is also the possibility of using a motor-generator set, the motor taking energy from the storage battery and the generator furnishing direct current at a convenient voltage. The objection to this arrangement is that with the arrangement of two generators in parallel, one at each end of the line, it would be necessary to extend the supply cables to the end of the road, and in many collieries, particularly in parts of Yorkshire, the danger of igniting gas would be too great. There is also the more serious objection that unless the motor-generator set were very carefully designed there might be a considerable variation of pressure at the generator terminals, necessitating some form of compensating apparatus to keep the potential constant. In practice a battery of Edison Lalande cells is much more easily handled and requires much less attention than the motor-generator, and there is absolutely no danger from its use.

In a later instalment shaft signals as they were in the past and as they are to-day will be described and illustrated.

Letters to the Editors

Inductive Load for High-Voltage Transmission Systems

To the Editors of the Electrical World:

SIRS:—The article on "Highest-Voltage Transmission System in the World," on page 795 of Vol. 59 of the *Electrical World*, is of particular interest, as it shows very clearly the limit of voltage in transmission over long distances. It seems to me, judging from the encouraging and favorable conditions at Au Sable, that the building up of a large, steady inductive load should be the leading principle in the management of such plants in order to obtain good voltage regulation and high power-factor and efficiency.

Zwickau, Germany. GUSTAV W. MEYER.

Quick Patents for Inventors

To the Editors of the Electrical World:

SIRS:—The recent editorial review respecting the Patent Office shows an intimate acquaintance with the present slow process of securing actions on applications for patents. It is pointed out correctly that the examining force, etc., are insufficient. Such opinions of influential men have hastened progress in this direction before, and it is hoped that further improvement will follow. I can remember when most applications were pigeonholed for three or more months before the inventor could know what the office was willing to allow. Now, applications are acted upon in as few weeks as formerly there were months. The next step toward the attainment of quick patents is about to be undertaken, inasmuch as the investigating committee appointed by President Taft urges upon Congress an appropriation for an adequate force to conduct the examinations so that by increasing the force and its remuneration applications may receive more immediate attention.

It is as absurd for an inventor to wait a long time for a decision as it would be for him to wait for the *Electrical World* several weeks after its publication. The only method of compensating for this loss of time is to rush applications into the Patent Office as soon as possible. We may expect soon to have a decision almost "by return mail," which has been approximated in a few instances.

Washington, D. C. EDWARD P. THOMPSON.

Measuring Temperature of Inaccessible Places

To the Editors of the Electrical World:

SIRS:—I have discovered a very simple method of taking temperatures in inaccessible places and think that other engineers will doubtless be interested in it. I have found the method most satisfactory in taking the temperature of oil in transformers at points where it is impracticable to insert or read a thermometer, but the method is applicable to ovens, refrigerators, distant rooms, etc. Although the principle is an old one based on the increase in resistance of a conductor due to temperature changes, I have not seen the formula used before.

Assuming that a commercial copper wire increases its resistance 1/234 for each Centigrade degree rise from zero, a coil of copper wire is wound which will have precisely 234 ohms resistance at zero C. (259 ohms at 25 deg. C.) and of a shape and size suited to the work. Using leads of negligible resistance and placing the coil in the medium whose temperature is desired, it is only necessary to measure the resistance of the coil by means of a bridge, ohmmeter or other method which will not cause it to heat, and its temperature may be instantly found by subtracting 234 from the value found. For rougher work, if the resistance is only 23.4 ohms, the determination of the temperature is as simple; while for more accurate work the error due to the resistance of the leads may be reduced by using a coil having a resistance of 2340 ohms at zero C.

Montclair, N. J. EDWARD D. CARTER.

Improvement in Prime Movers

To the Editors of the Electrical World:

SIRS:—I agree entirely with the sentiments expressed in the editorial in your first issue in 1912 bearing on the subject of prime movers, particularly that the demand of the age is for conservation of resources. I have read with pleasure the article on this same subject appearing in your issue of Jan. 4, 1913, in which you state that there has been no development along certain radical lines.

Believing that your readers will be interested in a phase of this subject, attention is called to United States patent No. 1,049,580, issued to me on Jan. 7, 1913, which aims at the delivery of practically the total heat generated by a fuel source to the cylinder of a prime mover. This method has recently been carefully considered by a number of prominent engineers, who have expressed the opinion that it is likely to prove successful and to be without practical disadvantage.

This method of generating a working fluid may be very briefly described by saying that the usual jacket water of a combustion engine is still further heated and vaporized and the products of combustion, after being cooled to a certain point, mix with the steam generated, probably superheating it. When desired, a diluent may be further supplied in the form of air, etc. There being no movable or working parts to the generator, much higher temperature can be maintained, thus requiring a relatively small unit for a large amount of power, which results in an increase in the theoretical efficiency. This type of apparatus is easily adaptable to change in load conditions. The Diesel oil engine is highly efficient, but it suffers from a jacket-water loss and an exhaust loss, both of which are recovered to a large degree in the machine designed by me.

New York, N. Y. EDWIN G. HATCH.

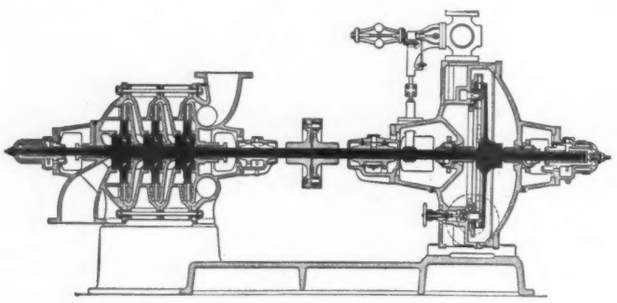
Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Boiler-Feed Pumps

By Alfred Williams

In most of the small central stations throughout the country the time-tried and time-honored simple reciprocating pump for boiler-feed purposes still holds sway, although in newer stations the compound steam-end reciprocating pump is used for the higher boiler pressures employed; but even the latter is fast giving way before the steam-turbine-driven or motor-driven centrifugal pump. This change has not been forced owing to any superior economy on the part of the latter unit, but because of its easier operation and lower maintenance cost. There is considerable room for improvement in those stations equipped with the simple reciprocating pumps, especially where the latter call for some 200 to 300 lb. of steam per indicated horse-power. If steam must be used, it would be preferable to employ an independent steam engine which will operate at, say, 60 lb. of steam per indicated horse-power. An argument frequently brought out by persons who oppose the use of electric motors for driving boiler-feed pumps is that the motor does not offer sufficient variation in speed to meet ordinary conditions of practice without introducing resist-



TURBINE-DRIVEN CENTRIFUGAL FEED PUMP

ance in the circuit. It is possible that very much energy might be wasted in this manner, and yet a great saving can be shown over the inefficient direct-acting steam pump. It has been suggested that in place of the single direct-acting steam pump a triplex pump be installed and that this pump be driven by a constant-speed motor or belted from the main engines. The variations in the rate of pumping can be taken care of by placing a by-pass valve in the suction to the exhaust of one or two of the pump cylinders. Then to vary the rate of pumping it would only be necessary to open the by-pass valve more or less. With the by-pass valve shut the pump works at maximum output. By opening the two by-pass valves wide the rate of pumping in a triplex pump would be reduced two-thirds. Such a pump would be most economically driven from the main engine shaft. The advantages and economy of using motor-driven or turbine-driven centrifugal pumps for feeding boilers are, however, too great to be ignored.

Among the points in favor of the centrifugal pump are the following: It has neither suction nor discharge valves; it possesses only one moving part, which is in continuous rotary motion, and it delivers the water in a constant stream in contrast with the intermittent impulses of the ordinary duplex pump so widely employed for this class of service. Since the stream of water is constant and without impulses, there is no vibration in the pipes and there is little chance for scale to deposit in them. The pump, moreover, possesses all the advantages of being valveless. There are, therefore, no plungers to be packed, no steam valves to reseat and no pistons to require new rings from time to time. A feature of the pump which is paramount is that when running at constant speed it delivers water at a certain pressure, which it cannot exceed by more than a few per cent, even though the delivery pipe be completely closed. With the reciprocating pump the latter calamity usually means a broken pipe or pump. This feature of the centrifugal pump makes it possible for a fireman to shut off the feed to any of the boilers or to all of the boilers without shutting off the pump, which in many plants would entail leaving the boilers and going to another part of the station. It is thus possible to feed the boiler automatically by installing a ball-float for each boiler, which would control a balanced valve in the feed pipe. This makes it unnecessary to have connections with a line supplying steam to the pump, as the latter runs continuously whether any of the boilers are being fed or not. This method of automatic feeding makes the boilers independent of each other and makes it unnecessary for the water line in all the boilers to be at the same level. This latter feature is important in stations containing several sizes of boilers or where some are of the vertical type and some of the horizontal type. It might be contended that the efficiency of a centrifugal pump operating under these circumstances would be very low when supplying only a small portion of its rated output, and that it would consume power when merely turning the water without delivering any. This objection in the case of a motor-driven centrifugal pump is of little moment when its many advantages are considered.

Exploding Powder Blasts with Central-Station Energy

By Ellery C. Arnold

For many years magneto generators of the plunger type have been used for exploding quarry blasts, but since the power of such "batteries" is always limited some powdermen have resorted to central-station energy supply lines for igniting the charges positively and safely. A charge that has missed firing represents not only a waste of so much explosive and labor but may be the source of considerable danger. Simultaneous or later blasts that are successful will scatter the unburned powder among the rocks and debris, and here it may be subsequently detonated by innocent workmen, with serious injury to themselves and bystanders. Observations in a single field where a good deal of blasting is carried on have convinced the writer that the loss of human life resulting from these "missed-fire" causes would be appalling if returns could be collected from the entire United States.

Some quarries are so located that 250-volt or 500-volt motor circuits are available. Where there are no such lines certain operators have preferred to install small generating sets, either engine-operated or turbine-operated direct-current outfits being generally used. It is a well-known fact that certain powders, like the gelatine explosives, lose the full effect of their power if not detonated properly. If several high-power fuses are employed, not only will the full effect of the explosive be realized but the danger of "missing" is minimized. For example, in a 5-in. hole 50 ft.

deep not less than three exploders should be used. The first fuse should be placed at the bottom of the hole. Then if a stone or piece of rock should fall in and block off the lower section of the dynamite provision will still have been made for detonating the isolated section of explosive. The other two charges should be placed respectively at the center and top of the bore, being covered with about 20 ft. of tamped earth. All three exploders are connected in parallel across the direct-current buses. As the cost of the extra exploders is only a small portion of the cost of the dynamite used, the extra units are well justified from the standpoint of material expense, even disregarding the potential danger of the possible "miss-fires."

Maintaining Operation During Construction Work

At the January meeting of the Pittsburgh Section, A. I. E. E., Mr. G. N. Lemmon presented an illustrated paper on "Maintenance of Operation During Construction Work."

In enlarging a plant already in service the first consideration, he declared, must be the safety of the men. Work on "hot" conductors carrying 2300 volts or more is often required, and careful selection and training of the workmen is essential. Suitable shields and temporary insulation are constantly needed, and for this purpose dry wood and rubber floor matting are valuable, but they are useless without ceaseless vigilance.

Indeed, constant watching is necessary everywhere. On a certain occasion an exciter was to be moved and one of the men went downstairs to take down the wiring. Happening to go to the wrong foundation, he cut the shunt-field wire the first thing and so shut down the station. Such an incident is the exception, of course, for good men take a keen interest in the work, and the man in overalls deserves high respect. The best friend the construction man can have is the operating engineer whose nerves extend along every wire and pipe in his whole station.

Outside of the station the lines must be kept alive, and linemen learn to trust ordinary triple-braid weatherproof insulation for 2300 volts, although not standard practice according to the handbooks.

The best engineering is that which furnishes reliable service for the lowest expenditure, and a good construction man learns to utilize everything that is available. Avoiding duplication and temporary work when possible, the construction work should be energetically prosecuted, but always the paramount issue is continuity of service. The lamps must burn and the motors must turn for twenty-four hours a day, which means that every second is to be counted. The spirit of loyalty among employees is always an important factor in the completion of a job. Men are usually willing to work on risky tasks and under adverse conditions because of their interest in the work.

In the discussion following the paper Messrs. L. O. Veser, of the Mahoning & Shenango Railway Company; G. C. Hecker, of the Pittsburgh Railways Company; J. S. Jenks, of the West Penn Traction & Water Power Company; K. C. Randall and P. M. Lincoln, of the Westinghouse Electric & Manufacturing Company; Henry Harris, of the Wilmerding Electric Company, and William Oschman, of the Oliver Iron & Steel Company, took part. Mr. Veser recounted his experience on a job at Reading, Pa., mentioned by the author of the paper, and Mr. Hecker described the installation of some 11,000-volt units replacing 2200-volt sets at the Brunot's Island power house of the Pittsburgh Railways Company.

Mr. Lincoln said that, from seven years' experience as an operating man, he could appreciate their troubles. The first law and gospel of the operating man is to "keep the juice on the line." Loyalty is common among men of the staff; they are generally ready to jump in and help. While admitting never having given an order for men to work on "hot" lines, Mr. Lincoln said he had sometimes found it convenient to accept volunteers for this work. Mr. Jenks said that financiers will usually approve any expenditure made for "continuity of service." During last season the West Penn company replaced 170 poles and 1800 cross-arms, with no interruptions. A twenty-two-panel switchboard was moved bodily from one part of the plant to another without interrupting service or so much as blocking a circuit-breaker. Leads of the proper length were spliced on and then the board was lifted by the crane. Such work, however, is very costly and is difficult to estimate accurately.

Cause of Dirt-Marking Beneath Open Wiring

A friend insists that the darkening of walls or ceilings beneath lighting wires is traceable to the heat produced in the wire, which sets up convection air currents carrying dust and dirt to mark the surface. It had been my impression that this was an electrostatic phenomenon. F. D. B.

Inspection of open wiring that has been installed even a short time will show this dirt-marking action to occur chiefly beneath the ungrounded wires of the group. Thus the neutral of a three-wire system, or the grounded side of a branch pair, will remain clean, while the "outside" wires become distinctly marked. In a pair one side of which is grounded the "live" conductor can usually be easily distinguished by the dust both on the insulation itself and on the wall beneath. Many wiremen depend on this little "kink" to pick out the grounded side, without other preliminary test. Even in an ordinary twisted-pair lamp cord, the wires will soon mark themselves unmistakably if flying dust is present in the room. The effect is clearly an electrostatic one, depending on the difference of potential between the charged wire and ground, which causes attraction of loose dust particles. Both wires of a pair are, of course, heated equally since they carry the same current, so that resulting air convection streams would affect each wire to the same amount. It is, moreover, unlikely that the heat that is produced in ordinary lighting conductors could set up distinguishable air movement to produce any such markings during the few hours daily that the circuit carries its load. The electrostatic action continues, of course, as long as potential is on the wires.

Condenser Prevents Cross-Talk

Please inform me how a condenser placed across the busbars of a storage battery supplying current to a common-battery telephone system will tend to prevent cross-talk. Has the condenser any other function in this case? A. G.

A condenser placed across the terminal busbars of a storage battery supplying current to a common-battery telephone system is useful in preventing cross-talk because of the fact that the battery is not of negligible impedance. If the battery circuit could be made to have absolutely zero impedance, there would be no occasion for the use of such a condenser. Since the impedance is finite, however, there will be fluctuations of potential at the battery terminals corresponding to the talking currents in circuits receiving current from the battery. Thus when two or more cord circuits are connected to the same busbars it might be possible to overhear in one circuit the conversation going on in another circuit, although the two circuits would be common only to the extent of the storage battery supplying current to the separate cord circuits of each. It is, therefore, desirable to place a shunt across the battery which will draw no current from it but at the same time will afford the least possible impedance to telephone currents, whose frequency ranges from about 100 to 2500 cycles per second, with an effective average of about 800 cycles per second. A condenser meets the requirements most satisfactorily and has no other function in this case than the one just described.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Synchronous and Non-Synchronous Reactance.—J. Rezelman.—The conclusion of his article, in which the author continues his investigations into the reactance of alternating-current machines. In this article he discusses fully the case of alternators having solid salient poles, both single-phase and polyphase. He now takes into account the effect of the changes of the exciting direct current in the magnet coils upon the reactance. A variation in the excitation is practically without influence on the impedance (and the reactance) in the antagonistic, but not in the transverse position.—London *Electrician,* Jan. 3, 1913.

Transformer Formulas.—J. K. Catterson-Smith.—The author gives a simple dimensional formula for alternating-current transformers and discusses its derivation for single-phase transformers, three-phase transformers, autotransformers and the proportioning of shell-type transformers. Several examples are added.—London *Electrician,* Jan 3, 1913.

Generation, Transmission and Distribution

Grounded and Ungrounded Neutrals.—S. E. Fedden.—An account of the experience in Sheffield where the question of grounding was settled a year and a half ago. The two-phase and three-phase systems are interconnected by T-connected transformers, and the first point to be decided was to provide a ground connection when the transformers were supplying three-phase current. The rating of each transformer is 1000 kva, and at heavy loads the transformers supplied three-phase current to several feeders. It was undesirable to ground the three-phase system through the neutral connections of the transformers, the chief reason being that should a ground develop on any of the feeders the overload relays on the transformers would operate and thus cut off all the supply, including the ground connections, without indicating the faulty feeder. Up to the present, grounding through a resistance on alternating-current systems only follows a similar arrangement with a direct-current three-wire system at 500 volts. The use of limiting devices now generally employed on high-tension three-phase systems causes an abnormal rise in pressure in the neighborhood of the fault. On the other hand, to allow 500 amp to stray between the fault and the neutral point of the system is not beneficial either to gas, water and telephone companies' property or to the distribution system. It was, therefore, necessary to adopt some other method of overcoming these difficulties. The arrangement adopted is shown in Fig. 1. It has the following advantages: The personal element of switching a working generator or transformer to earth is obviated. No expensive automatic selecting device is required. The earth current is limited to 51 amp, which is the current necessary to trip the Ferranti-Field discriminating device. The earthing device is in the form of a transformer arranged with the primary star-connected and the secondary delta-connected. Having the secondary delta-connected insures that the neutral point on the primary is always at earth potential, as proved by experiment. The grounding transformers are arranged to operate the trip coils of the respective switches in parallel with the overload and reverse-power relays. The power taken by the grounding transformer is 1250 watts.—London *Electrician,* Jan. 3, 1913.

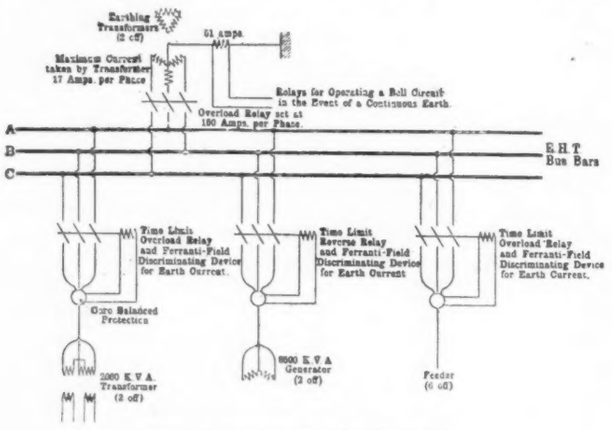

Earthing Transformers (2 off)
51 amps.
Maximum Current taken by Transformer 17 Amps. per Phase
Relays for Operating a Bell Circuit in the Event of a Continuous Earth.
Overload Relay set at 150 Amps. per Phase.
A
B
C
E H T Bus Bars
Time Limit Overload Relay and Ferranti-Field Discriminating Device for Earth Current.
Time Limit Reverse Relay and Ferranti-Field Discriminating Device for Earth Current
Time Limit Overload Relay and Ferranti-Field Discriminating Device for Earth Current.
Core Balanced Protection
2000 K.V.A. Transformer (2 off)
9500 K.V.A Generator (2 off)
Feeder (6 off)

FIG. 1—CIRCUIT ARRANGEMENT

Safe Operation of Electric Winding Engines.—A note on a discussion by G. K. Chambers of the problem of braking of high-speed electrically driven winding engines in South Africa. The failure of power may easily result from the opening of feeder circuit-breakers at the power station or in the transmission system or from the opening of circuit-breakers in the mine substation caused by heavy surges due to lightning discharges, mistake of the operator, short-circuit on the system, unusual overload or malicious injury to overhead lines. The reclosing of a circuit-breaker is a simple operation and one quickly performed if an attendant is on the spot, but usually the momentary opening of the circuit-breaker takes the control of his engine out of the driver's hands, and practically the whole responsibility of stopping the winder is thrown upon a safety device and mechanical brakes. It follows from this that mechanical brakes on electric hoists have to perform a duty rarely required of steam winders except in the case of overwind when the winding speed is usually much reduced—a duty, in fact, for which the latter may not necessarily have been designed. The mechanical braking of electric hoists must therefore be a more serious problem than that of steam hoists. This fundamental difference has not, perhaps, been sufficiently emphasized, and a proper appreciation of it is necessary not only in the case of existing steam engines which are converted to electric drive but also in the design of entirely new electric winding engines.—London *Electrician,* Jan. 3, 1913.

Peat and Electrical Engineering.—J. Teichmueller.—The conclusion of his long paper read before the German Association of Electrical Engineers. The methods of making the peat deposits of the Wiesmoor in Ostfreisland available for electric power generation and opening the district for farming purposes are described. It is estimated that the deposit contains about 22,000,000 tons of peat with a content of 30 per cent of water. With a yearly production of 20,000,000 kw-hr., this peat deposit is sufficient for 450 years.—*Elek. Zeit.,* Dec. 26, 1912.

Traction

British Electric Traction Statistics.—The annual statistical tables of electric traction systems in the United Kingdom. These deal with (1) tramways supplied with energy from "combined" power stations, (2) tramways with independent generating plant, and (3) electric railways. So

far as extensions and new routes are concerned, the year has not seen much change, but much work of an educative kind has been done, and the year 1913 will probably see great advances made in railway electrification. There is no room for much extension of electric tramways, most towns being already equipped, Edinburgh, with cable cars, forming a notable exception; but there appears to be a large field open for railless traction systems to outlying districts and as a means of linking up existing systems.—London *Electrician*, Jan. 3, 1913.

Gasoline Electric Car.—F. E. DRAKE.—A discussion of the use of the gasoline-electric car or "automotrice" on tramways with special reference to the Arad-Csanad railway in Hungary. "Within the limits of 40 tons total weight and a maximum speed of 45 miles per hour, the automotrice will be a most potent factor in making possible greater conveniences for the public and splendid economies for the lines operating." Within these limits 2.5 to 3 car-miles per gallon of combustible may be insured. At this economical point there is no danger of aggravated operating costs from threatened high price of combustible. So long as the mileage costs of crew are 50 per cent or more higher than the cost of combustible, the automotrice has an enormous field before it. The oft repeated query as to maintenance costs has been thoroughly answered by the Hungarian road, which has a mileage record total of 5,300,000 car-miles, covering seven years with maintenance costs of less than 3 cents per car-mile.—*Elec. Journal*, January, 1913.

Direct-Current Locomotives for Interurban and Main-Line Service.—S. T. DODD.—An article on the more important features of construction embodied in four sizes of locomotive for 600-volt direct-current operation. These are, broadly classified, the 25-ton, 50-ton, 75-ton and 100-ton units. After a general discussion of the four types as to their approximate field of application, the paper takes up their design in some detail under the headings of motor equipment, truck design, platform framing and superstructure.—*Gen. Elec. Review*, January, 1913.

Installations, Systems and Appliances

Ten Years of Electrical Industry in Japan.—S. W. SCHMIDT.—During the last ten years the electrical industry in Japan has undergone rapid developments. In 1901 there were forty-nine electric-lighting companies. This number increased in ten years to 122, while the length of the lines increased sixfold. In 1901 electric lamps were used in 48,000 houses in Japan, in 1910 in more than 600,000. In the same time the number of lamps increased from 300,000 to 1,900,000 and the number in streets from 6400 to 59,300. A large number of electric-lighting plants also operate street railways. From 1901 to 1911 the number of cities with electric railways has increased from eleven to forty, the length of lines from 72 miles to 692 miles, and the number of passengers per year from 47,000,000 to 396,000,000. Data are given of the financial results obtained by various electric companies in Japan. The history of this development is full of serious financial difficulties due to insufficient capital being provided for most of the undertakings, but the general situation has now been improved. Japan has sent many electrical engineers to the United States and Europe to study the latest methods, but there is great difficulty in instructing the workingmen. This is especially true of cable factories, which are otherwise operated under favorable conditions since they are usually connected with a large copper mine, from which they get the metal at lowest price, and are also protected by a high tariff. Nevertheless, they have been unable to get rid of competition from other countries because the quality of the imported cables is generally better than that of the cables made in Japan. The manufacture of lamps has increased considerably in Japan. Some of the Japanese electric companies import certain parts from Europe or the United States and assemble them in Japan. The value of electrical exports to Japan in 1910 was $1,660,000 from Germany, $1,000,000 from England, and $2,215,000 from the United States.—*Elek. Zeit.*, Jan. 2, 1913.

Japan in 1911.—A. A. BRANDT.—A review of the electrical industries in Japan in 1911. There are in Japan now 6731 factories in which the machines are driven mechanically. The total rating of machinery is 817,000 hp, of which 339,000 hp is steam engines, 69,000 hp gas engines, 7000 hp oil engines, 69,000 hp water turbines, 18,000 hp Pelton wheels, 247,000 hp generators and 67,000 hp electric motors. The number of workingmen in Japanese factories is 717,000, of whom only 3145 are employed in electric factories and shops. Since 1900 wages have increased by 30 or 50 per cent, so that if the smaller capacity of work of Japanese workingmen is taken into account, it is no longer true to speak of the extraordinary cheapness of Japanese labor for many industries. The new high tariff of 1911 has stimulated electric manufacture considerably. Carbon lamps are made to the extent of 5,000,000 per year in three factories and, with a tariff of 40 per cent *ad valorem*, imports have become impossible. Metallic-filament lamps are used only to a small extent in Japan. Most central stations have a flat rate and exchange lamps free of charge. However, the increase of load will cause the central stations to adopt a meter rate and to adopt metallic-filament lamps. At present about 500,000 metallic-filament lamps are made in Japan, the filaments being imported from the United States. In 1909 there were 111 electric lighting companies, with a capital of $28,000,000. This increased in 1910 to 122 companies, with a capital of $61,000,000. The reserve funds are in no proper relation to the invested capital. The reserve averages 5 per cent for central stations and 2 per cent for railways. The number of electric railway companies was thirty-four in 1910, with an invested capital of $47,000,000, and forty in 1911, with an invested capital of $80,000,000.—*Elek. Zeit.*, Jan. 2, 1913.

British Central Station Account.—An abstract of last year's financial report of the municipal electric supply station at Bolton. The coal strike has had considerable effect, the cost of fuel per kilowatt-hour increasing from 0.54 cent to 0.64 cent and the total generating expense from 0.86 cent to 0.96 cent. The distribution expense was 0.6 cent, the management expense 0.08 cent, the total cost exclusive of capital charges 1.24 cents, and the total cost including capital charges 2.18 cents (against 2.16 cents the year before). The net revenue per kilowatt-hour was 2.54 cents (against 2.68 cents).—London *Electrician*, Jan. 3, 1913.

Wires, Wiring and Conduits

High-Tension Cable.—L. LICHTENSTEIN.—An illustrated description of the high-tension cables on the single-phase railway from Dessau to Bitterfeld. The energy is transmitted from the power plant to the substation at 66,000 volts, and for this purpose there are available not only the overhead line but two underground cable lines, one of the latter being built by the Siemens-Schuckert company and the other by the Felten-Guilleaume company. Each of these three lines is sufficient to transmit the whole energy so that two lines are always held in reserve. The operation was begun in April, 1912, and since that time energy has been transmitted alternately over the two cable lines for periods of a week each, while the overhead line has been held in reserve. The distance of transmission is 4.3 km (2.5 miles). Each cable line, therefore, consists of about 8.6 km (5.2 miles) of single-core cables. Fig. 2 shows the cross-section of the cable of the Siemens-Schuckert company. The dimensions are given in millimeters (1 mm = 39.4 mils). The conductor is an aluminum wire strand of 100 sq. mm (0.155 sq. in.) cross-section. The dielectric consists of impregnated paper and has a thickness of 13 mm (0.5 in.). Around the paper insulation is a lead armor covered with a layer of jute with a coating of asphaltum and lime. The permissible current is 240 amp; for this

current the increase in temperature, when stationary condition has been reached, is 25 deg. C. The cable can transmit continually 14,400 kva. The same heating conditions and the same voltage drop could have been obtained with cable using a copper conductor of 57 sq. mm (0.088 sq. in.) cross-section. Aluminum was chosen in order to increase the diameter of the cross-section of the conductor

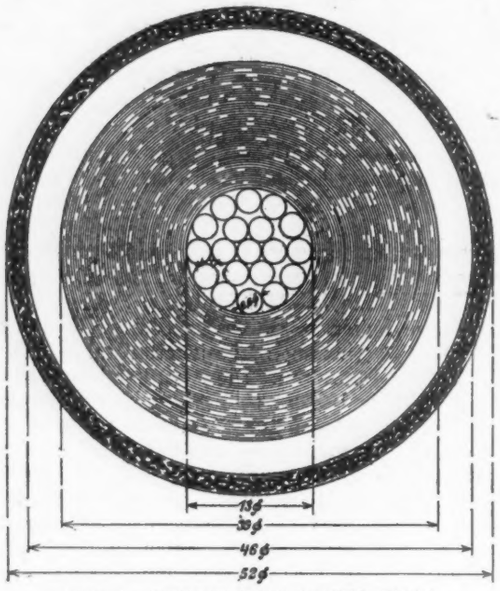


FIG. 2—CROSS-SECTION OF THE CABLE

for the purpose of decreasing the effective electric field intensity at the circumference of the conductor. This is with aluminum 4200 effective volts per millimeter, while with copper it would have been 4790 volts per millimeter. The difference is 14 per cent. Of course, when using the copper conductor it would have been possible to get the same value of the electric field intensity by increasing the thickness of the dielectric. If that had been done, the internal diameter of the lead armor would have been 42.9 mm instead of 39 mm. The cable was made in lengths of

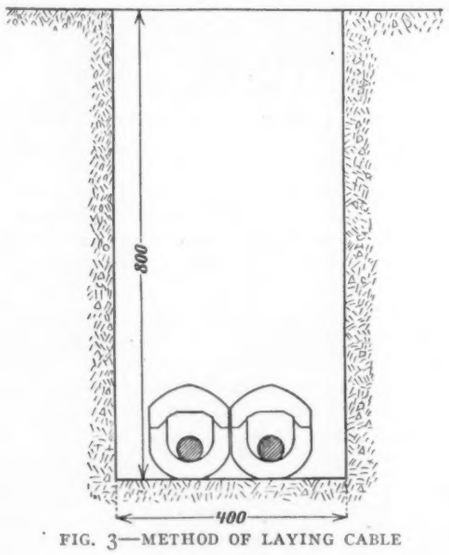


FIG. 3—METHOD OF LAYING CABLE

750 m (2460 ft.). Tests of the cable made in the cable works show the insulation resistances at 15 deg. C. to be 3000 megohms per kilometer, the resistance at 15 deg. C. to be 0.275 ohm per kilometer, and the capacity to be 0.169 microfarad per kilometer. From this it follows that the dielectric constant of the insulating material is 3.35. The method of laying the cables on the ground is shown in Fig. 3. Each cable is placed in a stoneware pipe filled with sand. After the cables had been laid underground the capacity was found to be 0.1705 mf per kilometer, the insulation resistance 8620 megohms per kilometer and the resistance 0.265 ohm per kilometer. From this value of the resistance it follows that the temperature of the cables in the ground is 4 deg. C. (39 deg. Fahr.). This is in good agreement also with the high insulation resistance of 8620 megohms per kilometer (against 3000 in the test in the plant). After continuous use for a year and a half there was an accident to a high-tension transformer, and the use of the cable had to be discontinued temporarily. A fault was found in the transformer and in the cable. On this occasion the electric constants of the cable were re-determined and it was found that they had not changed at all in the year and a half they had been in operation and that the cable was otherwise in good condition. The fault must, therefore, have been due to external forces. This is also probable because the other cable developed a fault shortly afterward, while both cables have since operated to perfect satisfaction.—*Elek. Zeit.*, Jan. 2, 1913.

Electrophysics and Magnetism

Electrified Particles Passing Through Matter.—N. Bohr.—A paper in which the theory of the decrease of velocity of moving electrified particles in passing through matter is given in a form such that the rate of the decrease in the velocity depends on the frequency of vibration of the electrons in the atoms of the absorbing material. It is shown that the absorption of alpha rays in the lightest elements can be calculated from the information about the number and frequencies of the electrons in the atoms which is obtained from the theory of dispersion, and that the values are in good agreement with experiment. For elements of higher atomic weight, it is shown that the number and frequencies of the electrons to be assumed, according to the theory, in order to explain the absorption of alpha rays are of the order of magnitude to be expected. It is further shown that the theory can account for the form of the relations between the velocity of the rays and the thickness of matter traversed, found by experiments with cathode and beta rays. The absolute agreement as to the magnitude of the constants entering in the relations in question is very good for the fastest beta rays, but not so good for slower beta rays and for cathode rays—a fact which may be due to the very difficult experimental conditions for these latter rays. Adopting Rutherford's theory of the constitution of atoms, it seems that it can be concluded with great certainty, from the absorption of alpha rays, that a hydrogen atom contains only one electron outside the positively charged nucleus, and that a helium atom contains only two electrons outside the nucleus. The latter was necessarily to be expected from Rutherford's theory.—*Phil. Mag.*, January, 1913.

Non-Newtonian Mechanics.—Richard C. Tolman.—A mathematical paper in which it is shown that the Einstein transformation equations and the other principles of non-Newtonian mechanics lead to a number of further transformation equations for acceleration, mass, rate of change of mass and force. The transformation equations of force are identical with those chosen by Planck. Two applications of the transformation equations are given. By combining them with Coulomb's law, the expected equations are derived for the force with which an electric charge in uniform motion acts on any other charge, and by combining them with Newton's law a new expression is derived for the gravitational force with which a particle in uniform motion acts on another.—*Phil. Mag.*, January, 1913.

Electrochemistry and Batteries

Storage Battery.—A note on a recent British patent (No. 29,318, Dec. 27, 1912) of W. Clark (Compagnie Internationale des Accumulateurs Vedeka). Cells of high capacity and light weight are made by supporting the active material

by a foraminous structure of insulating material provided with conducting wires for distributing the current throughout the mass of active material. Each electrode is enveloped in a pyroxylin porous sheath, foraminous separators being interposed between adjacent plates of opposite polarity. The whole assemblage of plates and separators is maintained under yielding pressure applied normal to the contiguous surfaces of the electrodes and separators. The construction of the active parts of the plates is described, and in order to increase the mechanical strength nitrated cotton threads treated with acetone may be embedded in them, about 5 per cent of caustic soda or potash is added, and a treatment with ammonia to get porous lead, yet of increased hardness, is applied.—London *Elec. Eng'ing*, Jan. 2, 1913.

International Electrotechnical Commission.—SILVANUS P. THOMPSON.—A paper read before the (British) Institution of Electrical Engineers on the aims and the work of the International Electrotechnical Commission. "It cannot but be admitted that the generous support which the commission is meeting with in the various countries and the cordial way in which the delegates are conducting their deliberations are bound to lead to useful and practical results. The promotion of a better understanding between electricians of various nations by general agreement as to terminology, symbols and the classification of electrical machinery is sure to foster the free development of international trade and to be a general benefit both to the purchaser and to the maker. Last, but by no means least, these regular international gatherings, during which national prejudices are laid aside and at which many lasting friendships are made between electricians of different nationalities, must undoubtedly be a not unimportant factor in furthering the peace of the world."—London *Electricain*, Jan. 3, 1913.

Units, Measurements and Instruments

The "Kelvin."—PERCY GOOD.—The British Board of Trade unit, or kilowatt-hour, is 3,600,000 joules, and it had been proposed to give it the name "kelvin." This has not been done, as it seemed unlikely that it would be universally accepted. The writer suggests that 10,000,000 joules be called one kelvin; so that 10,000,000 ergs = 1 joule, and 10,000,000 joules = 1 kelvin. The kelvin is thus a mechanical as well as an electrical unit. The effect in practice would be to convert a present price of 8 cents per kw-hr., or unit, to 22 cents per kelvin. In an editorial on the standardization of the terms it is thought that this would be hardly worth while. "We have ohms, but nobody seems to wish for a special name to indicate either megohms or microhms, and even the joule is not very popular." Kelvin's name might be used in connection with a thermodynamic scale of temperature, or "if Kelvin's name is to be honored electrically let it then be used to indicate a quantity for which a name is really desired. For example, there is no name in general use for conductance. The mho has never been popular, and everyone will admit that 'reciprocal ohm,' although correct, is cumbersome."—London *Electrician*, Dec. 27, 1912.

Induction Balance.—JOHN P. DALTON.—A mathematical notice on the energetics of the induction balance, giving a simple general formula for the case in which each arm contains resistance, inductance and capacity, the capacity being shunted across part of the arm only. The general formula derived by the author is applied to methods for comparison of inductances, comparison of capacities and comparison of an inductance with a capacity.—*Phil. Mag.*, January, 1913.

Shop Testing of Electrical Apparatus.—The first of a series of articles describing in detail present-day practice in the testing of various types of electrical apparatus. In the present instalment the use of meters and temperature tests are discussed.—*Elec. Journal*, January, 1913.

Exhibition of Apparatus.—The conclusion of a description of the various electrical exhibits at the recent annual exhibition of scientific and technical apparatus of the Physical Society in London.—London *Electrician*, Jan. 3, 1913.

Telegraphy, Telephony and Signals

Directive Wireless Telegraphy.—F. ADDEY.—A paper read before the (British) Institution of Post Office Electrical Engineers. After a brief survey of different types of directive aerials, the author proceeds to discuss their chief uses—namely, (1) to increase the range of a wireless station; (2) to enable ships to obtain the bearings of wireless stations on shore. The methods of Marconi and of Bellini and Tosi are described. Two methods by which a ship can herself take her bearings by wireless telegraphy are given —(1) the telefunken; (2) the Marconi wireless compass. Some description is given of the equipment on the steamship *Onward*. Finally, the utility of the methods described and some of the conditions necessary for success are discussed.—London *Electrician*, Dec. 27, 1912.

Miscellaneous

Lightning Protection of Buildings.—E. J. BERG.—An article discussing the theory of protection of buildings against lightning. The author deals with the electric constants of lightning rods, the electric characteristics of lightning itself, the principal uncertainties in the theory, and gives some practical hints on installing lightning rods. —*Gen. Elec. Review*, January, 1913.

Belt Accidents.—W. O. HORSENAILL.—An article on belt accidents and their bearing upon individual electric drive.—London *Elec. Review*, Dec. 20, 1912.

Book Review

RADIOTELEGRAPHISCHES PRAKTIKUM. By H. Rein. Berlin: Julius Springer. 214 pages, 170 illus. Price, 8 marks.

Engineers engaged in wireless telegraphy work have often felt the want of a laboratory manual which would cover more or less completely the subject of high-frequency current measurement. In this book the author has aimed to cover the subject, and it will form for wireless engineers a welcome addition to their literature. The author gives a number of methods for the determination of the various constants which are of importance in wireless telegraphy inductance, capacity, wave-length, damping, etc. He also gives a brief discussion of the various apparatus necessary for the equipment of a commercial station. He does not enter into a theoretical discussion of measurements, but gives only a brief description of each method, illustrated with diagrams and the final formula. We believe, however, that the book could have been made of much greater value if the author had pointed out briefly the relative advantages of each method, under what conditions any particular method is to be used in preference to others, and the degree of accuracy that may be expected from the different methods in the measurement of any particular constant. As it is, the experimenter will be obliged to consult other reference books to ascertain these points, and the uninformed experimenter will be somewhat at a loss to know which method to use in any particular case.

The book is fully illustrated, having a large number of diagrams and photographs of commercial apparatus, but the apparatus described is mostly of German make. The American work on subjects related directly or indirectly to wireless telegraphy has been ignored entirely. We note, for instance, that in the discussion of high-frequency alternators the work of Fessenden and Alexanderson is not considered, though it is well known that the General Electric Company has built several 200,000-cycle alternators which have been in actual operation for some time. In the bibliography on the subject of inductance the work of the United States Bureau of Standards is not mentioned.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Large Direct-Current Units for Cleveland Company

In the heart of the city of Cleveland lies a compact area in which there is a heavy demand for direct-current energy combined with a large market for steam heating during the winter months. In order to care for this special set of conditions the Cleveland Electric Illuminating Company maintains a generating station in this district and uses the exhaust steam from the turbines for heating. The accompanying illustration shows the latest addition to this plant. This turbo-generator set, which was designed and manufactured by the Westinghouse Machine Company and the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, Pa., is the largest direct-current unit of the kind yet constructed, the rating of the generator being 3750 kw.

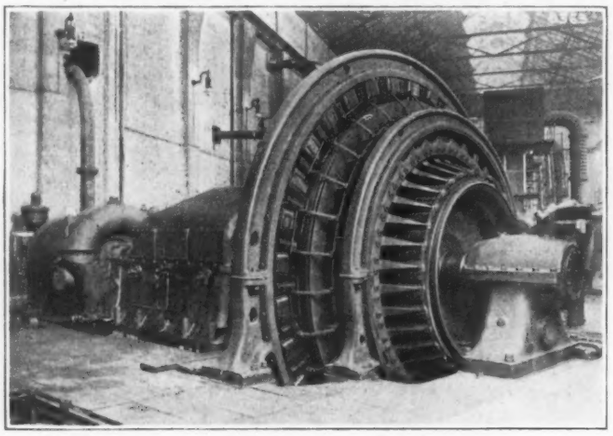


FIG. 1—3750-KW TURBO-GENERATOR SET

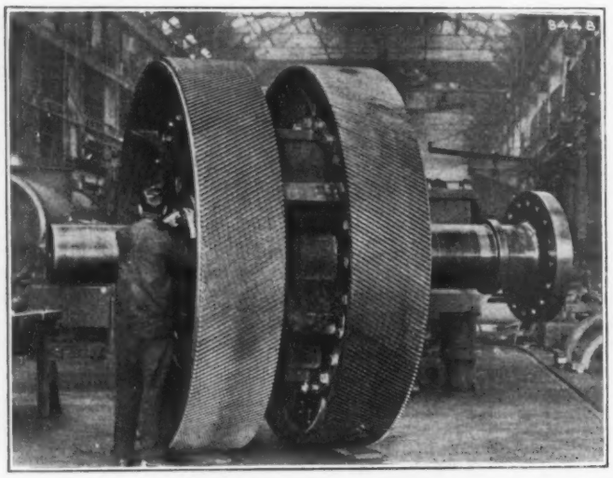


FIG. 2—LARGE REDUCTION GEAR OF 3750-KW TURBO-GENERATOR SET

The operating speed of the turbine is 1800 r.p.m., and since it is impossible in the present state of the art to build a generator of this size which will be able to operate at high speeds a reduction gear has been interposed between the two machines. The reduction ratio of the gear is 1 to 10. The large gear of this speed-reducing mechanism shown in Fig. 2 is 100 in. in diameter and has 259 teeth. The pinion has twenty-six teeth, and the ratio of 26 to 259 gives the "hunting-tooth" feature which has been recognized as desirable in the design of toothed gearing. The speed of this gear at the pitch line is approximately 54 miles an hour. At full rated load of the generator the gear transmits 5350 brake-hp, and on several occasions during overloads it has carried 6000 brake-hp without giving any indication that its ultimate safe output had been reached.

The dynamometer feature of the floating-frame construction provides a check upon the accuracy of the electrical instruments that measure the generator output. In this station a considerable error in the calibration of the wattmeter was detected by comparing its readings with those of the power indicator on the floating frame.

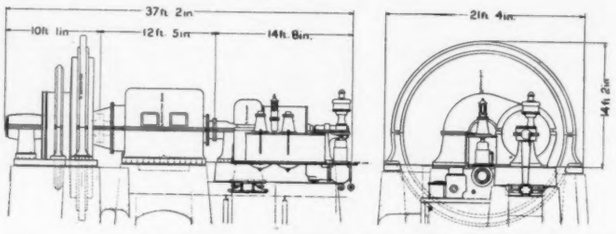


FIG. 3—SIDE VIEW AND END VIEW OF TURBO-GENERATOR SET

A second unit, which is an exact duplicate of the one that has been installed, is now being erected in the same station, and it is expected that it will be put into active operation in the near future. The line drawing shown in Fig. 3 gives a good general idea of the relative size and proportions of these units.

Engine-Room Alarm Equipment

The accompanying diagram shows the circuit arrangement of an electric engine-room alarm system which has recently been put upon the market by the Acme Electric Company of Knoxville, Tenn. In this system electric thermostat units are employed in connection with contact alarms, the former being used on bearings and generator frame and the latter on engine governors and circuit-breakers. For the thermostat units a hole 0.5 in. by 1 in. is drilled in the castings of each bearing and at suitable places in the frame. A coil of insulated iron wire incased in a brass tube is sealed in each of these holes and the coils are then connected in series with each other and with an adjustable relay, a milliammeter and an adjusting coil and are supplied with energy from some constant-voltage source of direct current. The resistance of the circuit varies with the temperature of the iron wire coils and this changes the value of the current in the milliammeter. The relay circuit carries about 0.3 amp continuously, and the relay is set so that when the current value falls to 0.25 amp the spring tension overcomes the relay and closes the alarm-bell circuit. It is claimed that the current taken by the thermostat coils is so small that the heating effect produced by it is negligible, and it is further stated that when the

milliammeter has been once calibrated and the adjusting coil set the system requires very little attention.

A parallel circuit from the same source of direct current serves the contact devices which are connected to the main voltmeter, the engine governors and the circuit-breakers. These contacts have been so placed that the circuit is completed when the voltage or engine speed varies beyond set

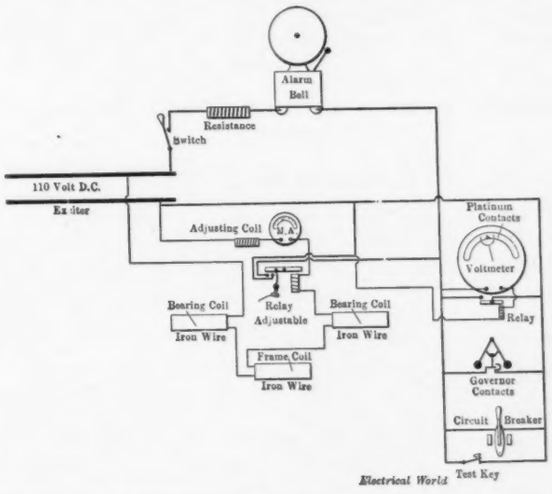


DIAGRAM OF CONNECTIONS OF ENGINE-ROOM ALARM EQUIPMENT

limits and when the circuit-breaker is thrown open. These contacts operate the same alarm bell as do the thermostat units. In order to preclude false alarms from the governor or voltage variations when stopping or starting the generator a single-pole single-throw switch has been placed in the alarm circuit. This switch is not closed until conditions have become stable after starting. It is claimed that this system may be used in factories and mills with a high degree of success as a detector of abnormal operating conditions.

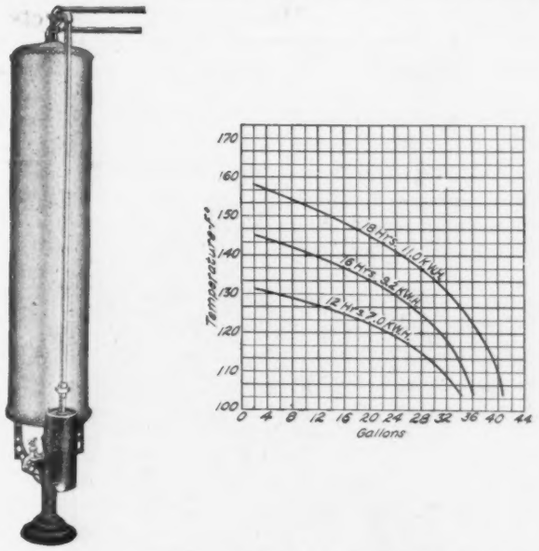
Domestic Electric Water Heater

The widespread use of electrically heated household utensils, and especially the introduction of electric ranges, has created the demand for a suitable means to provide hot water electrically. It is obvious that the simplest method of supplying this hot water in sufficient quantities for general purposes is to attach an electric heater to the usual 30-gal. or 40-gal. kitchen boiler, much after the fashion of the gas-heater attachments. The circulation water heater shown herewith is a small attachment applicable to any tank. The water circulates naturally from the bottom of the tank through the heater and up to the top of the tank.

The heater consists of a hollow, closed cast-iron cylinder, with a hole at the top and one at the side for the water-pipe connection and one in the bottom for the heating unit. A dead-end steel tube, inserted through the bottom hole, provides a receptacle for the heating unit. The unit can be readily removed by unscrewing the porcelain terminal block. This device is furnished in 600-watt, 1000-watt and 2000-watt sizes and can be used intermittently or left continually in the circuit. It is claimed that when used intermittently the 2000-watt size is most satisfactory, the 600-watt size being most suitable for continuous service.

To prevent the water from cooling rapidly it is well to cover the tank with magnesia asbestos slabs or hair felt about 2 in. thick and to apply a thin layer of magnesia cement to fill up the cracks between the slabs. A canvas covering which may be either sewed together or glued should be placed over the lagging. The pipes may be covered with standard pipe covering. The heater will operate either on alternating current or direct current and is designed for potentials of 100 volts and 250 volts.

The curves shown in Fig. 2 are plotted from the results of tests made with heaters of the different ratings operated in connection with a 40-gal. tank. These curves show the temperature of each succeeding gallon of water drawn off



FIGS. 1 AND 2—ELECTRIC HEATER AND PERFORMANCE CURVES

after the heaters have been in operation for the various periods of time. They are based on the assumption that the water enters the tank at 50 deg. Fahr. and that the tank has a thermal insulation of 2 in. of hair felt. This heater is manufactured by the General Electric Company.

Electrically Controlled Draft Regulation for Steam Boilers

In order to facilitate the operation of steam boilers using a very cheap grade of coal, the Diehl Manufacturing Company, of Elizabethport, N. J., has evolved a system for controlling forced draft and for acting in connection with the natural draft of the furnaces. The apparatus is electrically energized and automatically controlled and purports to be an economical addition to any boiler room. A multivane fan connected to a main shaft and driven by a vari-

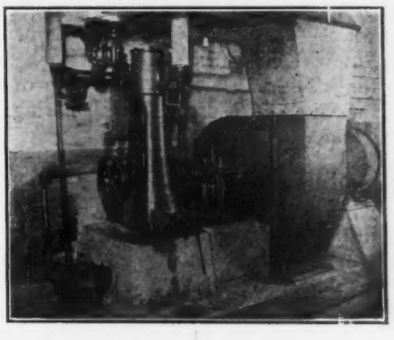


FIG. 1—ENGINE-DRIVEN BLOWER

able-speed motor furnishes the air for the forced draft. Arrangement is also made for connecting a relief motor or a steam engine to this shaft in times of emergency. The driving motor is a shunt-wound machine inclosed with wire screens to guard against the dust and dirt so prevalent in a boiler room. A contactor panel and an automatic motor starter are the other necessary adjuncts to this system.

When the steam pressure in the boilers has reached a point above normal pressure the regulator piston shown in Fig. 2 will be at the extreme end of its stroke. The piston in this position brings the contact levers into operation and stops the motor. As soon as conditions demand higher steam pressure the movement of the regulator is transmitted through chains to the two circular contacts, which close

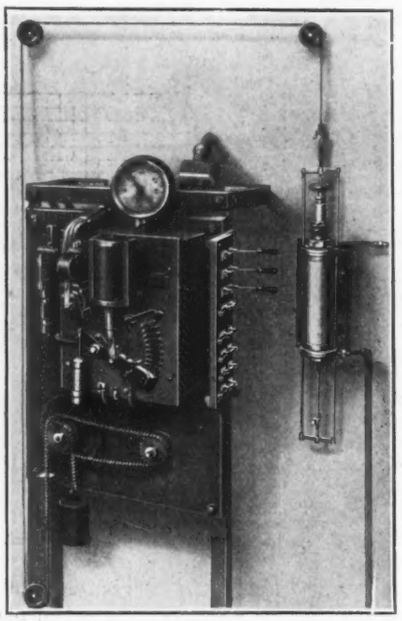


FIG. 2—REGULATOR PISTON AND ELECTRIC CONTROL APPARATUS

the clapper switch and operate the starter. The motor starts at the minimum available speed, and when the heavier draft is required a higher speed is attained by the automatic manipulation of the motor-field resistor, which is located behind the switchboard. A series of small limit switches attached to the panel allow the maximum and minimum speed adjustments to be made at will.

Exhibits at Peoria Electrical Show

The general illumination for the Peoria (Ill.) Electrical Show held at the Peoria Coliseum Jan. 18 to 25 was furnished by fifty-six "urnolite" fixtures suspended from the roof girders of the building and underneath the balconies. These fixtures, made by the Holophane Works of the General Electric Company, consist of bowls or urns, 15 in. in diameter, of white Velaria glass, and each one contains a 400-watt tungsten lamp. The "urns" are of ornamental design, and, when lighted, present the pleasing appearance of softly glowing alabaster.

A handsome Rambler gasoline automobile was shown, particularly on account of the automatic electric equipment of the United States Light & Heating Company for self-starting, ignition and lighting.

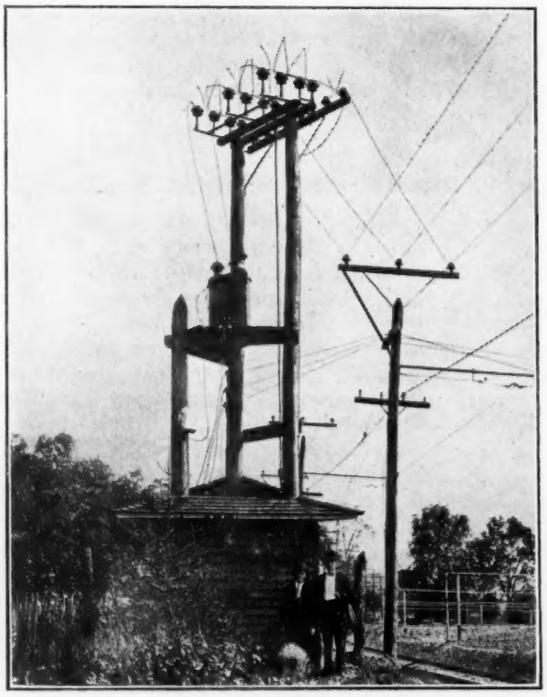
Among the exhibitors were the Apex Appliance Company, Chicago (washing machines); W. B. Brown Company, Bluffton, Ind. (wooden lighting fixtures); Central Telephone & Electric Company, St. Louis; Chicago Fuse Manufacturing Company, Chicago; Holophane Works of General Electric Company, Newark, Ohio; International Correspondence Schools, Scranton, Pa.; Kinetic Engineering Company, Philadelphia (organ blower); M. Klein & Sons, Chicago (tools); C. S. Knowles, Boston (switches and sockets); Lindstrom-Smith Company, Chicago (heating devices); Mills Electric Company, Peoria; 1900 Washer Company, Binghamton, N. Y.; Palmer Electric Company, Peoria; Pass & Seymour, Solvay, N. Y. (sockets); Pelouze Manufacturing Company, Chicago; Retherford Brothers Company, Muncie, Ind. (fixtures); Robbins & Myers Company, Springfield, Ohio (fans and small motors); Thordarson Electric Manufacturing Company, Chicago.

The Peoria Gas & Electric Company and the Illinois Traction Company were the utility companies exhibiting, the latter, as mentioned elsewhere, showing an operating installation of electric block signals made by the Union Switch & Signal Company, of Swissvale, Pa.

A daily paper, the *Electrical Show News,* was printed in an exhibit space and distributed to visitors. Mr. H. E. Gates was the editor.

Electricity on the Farm

Near the city of Marietta, Ohio, on the banks of the Muskingum River lies the 60-acre farm of Mr. W. W. Mills, a Marietta banker who is vice-president of the Parkersburg, Marietta & Interurban Railway Company. It has been the endeavor of the owner of this choice bit of river valley to make it one of the best equipped and most modern farms in the land. The interurban company's transmission line paralleling the river made the problem of obtaining electrical energy a comparatively simple one. It was only necessary to tap the 22,000-volt line, install a transformer and switching apparatus and distribute the energy at low voltage for various applications about the premises. The accompanying illustration shows the simplicity of the installation, which consists of a three-phase, 60-cycle, 15-kva standard outdoor-type transformer, giving 110 volts or 220 volts on the secondary. The small building contains the switchboard, a watt-hour meter and the auto-starter for a 10-hp motor, which is located about 1200 ft. away on the river bank. The motor is used for pumping water into a tank located



TRANSFORMER STATION FOR A FARM

just back of the house. When desired, the pump may also be used for irrigating the truck farm. This operation is accomplished by allowing the water to flow by gravity through piping which is perforated at intervals to spray the water over the land. For convenience in the home there have been installed electric toasters, stoves, irons, a vacuum cleaner, sewing-machine motor and washing machine.

Besides adding to the comforts and convenience of the owner this installation has proved to the officials of the railroad company that it is entirely feasible to tap the transmission line, which has been used only for supplying energy to the railway for motor and lighting service. By this means it is possible to supply energy in a number of small towns and to derive considerable additional revenue. The transformer for this installation was furnished by the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, Pa.

Commercial Electric Vehicles at the New York Auto Show

At the dual automobile show held in New York during the week eight manufacturers of commercial electric vehicles have had their trucks on exhibition. The exhibits of these manufacturers were grouped on the first floor of the New Grand Central Palace and surrounded by their more numerous gasoline competitors. At the Madison Square Garden show the entire first floor was given over to gasoline trucks and the balconies were occupied by the displays of the manufacturers of automobile accessories. The features of the various commercial vehicles are outlined in what follows.

ATLANTIC VEHICLE COMPANY, of New York City, had on exhibition one 5-ton chassis. The trucks are made in 1-ton, 2-ton, 3½-ton and 5-ton sizes and are of similar construction as regards details, differing only as to dimensions. The "Exide" or "Edison" batteries are used, being carried in cradles suspended from the frame, thus permitting of loading or unloading from either side. The controller is arranged for four forward speeds and two reverse speeds. The motor is suspended from the side members of the frame by a steel cross member and drives the rear wheels through a Morse silent chain to the jackshaft and a double chain to the wheels. All wheels are mounted on roller bearings. The rear wheels are equipped with internal expanding brakes of the shoe type.

BAKER MOTOR VEHICLE COMPANY, of Cleveland, Ohio, showed one 500-lb. panel body service wagon, two 1-ton panel body trucks, two 1-ton delivery wagons and one 3½-ton truck with a post body. The accessibility of all working parts of the mechanism that need attention, adjustment or lubrication is a feature of this truck. The motor is of the four-pole series type rated at 4 hp. The standard battery equipment comprises forty-two cells of seventeen-plate lead battery. A silent chain drive is employed from the motor to the jackshaft and two roller chains from the jackshaft to the rear wheels. The wheels are fitted with Timken roller bearings and ball bearings are applied to the motor and the jackshaft. The battery is underslung to facilitate the operation of dismantling.

GENERAL MOTORS TRUCK COMPANY, Detroit, Mich., had a 3-ton chassis, a 0.5-ton delivery wagon, a 5-ton brewery truck and a 1.5-ton chassis on exhibition. The vehicles of this company differ in design from other commercial vehicles. The general differences lie in the method of mounting the battery and the drive. The battery box is a separate and independent unit of the chassis and is mounted in front of the car on top of the chassis. This arrangement renders the cells easily accessible by raising the seat and the battery cover. This method of mounting, it is claimed, gives better weight distribution. The controller, switches, meters, etc., are placed in the controller housing, where they can be instantly inspected by opening the door. A brake equipment of the double internal-expanding type is used on the rear wheels and on the driving shaft. A spring blade shaft has been used to connect the single ball-bearing motor to the driving gear, increasing the tire life and cushioning all violent strains on starting and stopping. Standard batteries and standard roller chains are used.

GENERAL VEHICLE COMPANY, of Long Island City, N. Y., had six machines on exhibition—a 1-ton truck with crane attachment for hoisting and a 2-ton panel-body truck, a 1-ton chassis, a 3½-ton express wagon, a 3½-ton brewery truck and a 5-ton keg truck. In all of these vehicles the battery is underslung and a double chain drive is employed from a single motor. The wagons of all sizes are built on a running gear of uniform design which has been standardized, while the bodies are adapted to the requirements of varied service. General Electric Company standard motors and controllers are employed and the battery equipment is ample for a full day's run. The countershaft consists of two short shafts connected by a differential of the spur-gear type, each shaft being connected to a rear wheel through sprockets and roller chain.

LANSDEN COMPANY, of Newark, N. J., exhibited a 750-lb. package wagon, two 1000-lb. delivery wagons, a 2-ton truck, a 3½-ton truck, the chassis of a 3-ton truck and a heavy ambulance. The feature of this exhibit was the light package wagon which this company has recently added to its line. The battery in this wagon is mounted under the driver's seat and in the front part of the wagon bed. It is stated that this car will operate at 15 miles per hour and consume only 2¾ amp-hr. per mile. The standard battery equipment consists of fifty Edison cells. The power unit has a three-point suspension and transmission is accomplished through inclosed gears from the motor to a live rear axle. This car has been designed to meet the demand for a reliable light delivery car that may be operated at high speed and low cost and has followed the general lines of the company's standard designs.

STUDEBAKER AUTOMOBILE COMPANY, of South Bend, Ind., is showing a 1000-lb. panel-body wagon, a 2-ton truck and a 1½-ton special worm-gear-drive delivery wagon which is just being put on the market. This special vehicle follows the general design of the former trucks of that company and has the single motor suspended from the chassis. The armature of the motor is directly connected to the worm of a worm and wheel drive, which transmits the power to the wheels through a short shaft and differential gearing. The car carries forty-two cells of battery and will develop a speed of 12 miles per hour. A very high efficiency is claimed for the worm and wheel drive.

WARD MOTOR VEHICLE COMPANY, of New York, had four vehicles on exhibition—a ½-ton wagon, a 1-ton wagon, a 2-ton truck and a 4-ton truck. The battery in all of these vehicles is underslung. The smallest wagon has a single motor with silent chain drive to the countershaft and double roller chain drive to the rear wheels. Two brakes and a continuous-torque controller are provided. The steering gear is of the lever type.

WAVERLEY COMPANY, of Indianapolis, had on exhibition a 1000-lb. chassis, a 1000-lb. delivery wagon, a 5-ton brewery truck and in addition to these a convertible roadster. In all of the lighter vehicles of this company the motor shaft runs parallel to the rear-wheel shaft and is connected thereto by herringbone gears. The battery is underslung. For the heavier types of cars final chain drive is provided.

Ignition System for Gasoline Engines

The Western Electric Company has recently placed on the market a device known as a "synchronizer," designed to take the place of a magneto for gasoline automobile ignition service. With the synchronizer it is said to be possible to obtain either a vibrating or a non-vibrating spark, so that the engine may be started on the vibrating and run on the non-vibrating spark. A dash-lock switch is used and all adjustments may be made from the driver's seat. There are no moving cables and no platinum points under the distributer, the circuit being broken in the switch. These features, the manufacturer claims, simplify the maintenance problem considerably.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Western Electric's Exhibition Conference.—In order to afford its salesmen more intimate contact with the products they are selling, the Western Electric Company held an exhibition at the Masonic Hall, New York, Jan. 22 to 24, inclusive, at which samples of all of the materials which the company handles as a jobber were shown. Over one hundred salesmen from the New York, Boston, Buffalo, Philadelphia and Pittsburgh branches of the company were present. The exhibition was under the direction of Mr. E. W. Rockafellow, general supply sales manager of the company. The room in which the exhibit was held was well adapted for the purpose, being a corner one about 160 ft. long by 60 ft. wide, with many windows. Along the four sides were tables containing a complete line of the electrical supplies and apparatus sold by the company in its jobbing capacity, while on posts along the middle of the room were revolving panels bearing a large variety of small electrical supplies, all of these exhibits being under the immediate supervision of a representative of the manufacturing company that made them. The exhibition was opened on Jan. 22 at 9 a. m. by Mr. Rockafellow, who gave a short address outlining the purpose of the exhibit, and from 9:15 a. m. until noon the salesmen visited the exhibits. As only three salesmen were allowed at one booth at one time, all had ample opportunity to examine each piece of apparatus minutely and to discuss its merits and improvements in its design. From 12:30 p. m. until 1:30 p. m. luncheon was served in the Masonic Club restaurant, the privileges of which were extended to the company during the exhibition. After luncheon and until 5:30 p. m. visits were made at the various exhibits, and a lecture was delivered by Mr. A. F. Crosby, of the American Cross Arm Company. The program on Thursday was substantially the same, with the exception that from 4 p. m. to 7 p. m. the exhibit was open for the friends and customers of the salesmen. In this way the exhibition became a miniature electrical show, differing from the usual electrical show in that the exhibits offered something more particularly of interest to the electrical trade than to the general public. The session was brought to a close on Friday night with an informal banquet at the new Hotel McAlpin. During the three days the salesmen were obliged to do more than merely look at the exhibits. As each man entered the room on Wednesday, the opening day, he received an envelope containing some thirty-three cards. Upon each of these cards was the salesman's name and the name of one of the manufacturers whose products the Western Electric Company handles, together with the number of the booth at which this manufacturer's product was on view. Each man was required to visit each exhibit, submit to the manufacturer's representative the card bearing that manufacturer's name, and was then questioned by the manufacturer's representative as to his knowledge of the product. He also had his own questions answered by the representative. The card was then left by the Western Electric salesman with the manufacturer's representative, who marked upon it in a ruled space what part of the Western Electric sales department the salesman belonged to—whether telephone, supply or otherwise—together with his impression of the salesman's knowledge of that particular line. In other words, he noted whether, in his opinion, the salesman was well or only fairly well informed on this line of equipment. In this way a record was made of each man's visits to the various exhibits and of his knowledge of each class of material that the company handles. On Friday afternoon from 1 to 4:30 o'clock an oral examination was held by the exhibition committee, a list of whose members appears below. Each man was asked what each piece of equipment is for, how it works, etc. The replies and the opinions of the manufacturers' representatives, as obtained from the cards, will be taken into consideration by the committee in determining each man's standing with the company. The exhibit will be taken next to Chicago so that the men from the central district can participate in its benefits, and will then be shown in the company's other districts. The committee consisted of M. A. Oberlander, P. L. Thomson, G. A. Knoche, Gregory Brown, W. A. Schnedler and H. R. King, the latter being chairman. Among the exhibitors were the American Electric Heater Company, American Ever Ready Company, American Washer Company, Benjamin Electric Manufacturing Company, Bryant Electric Company, Crouse-Hinds Company, D & W Fuse Company, Thomas A. Edison, Inc., Edwards & Company, Electric Storage Battery Company, Electrose Manufacturing Company, General Electric Company, Harvey Hubbell, Inc., Habirshaw Wire Company, Holophane Works of General Electric Company, Hubbard & Company, Mathias Klein & Sons, W. N. Matthews & Brother, National Metal Molding Company, Pittsfield Spark Coil Company, Phillips Insulated Wire Company, Stanley & Patterson, B. F. Sturtevant Company, Sunbeam Lamp Company, Taunton-New Bedford Copper Company, Tungstolier Works of General Electric Company, Western Electric Company (telephone apparatus), Westinghouse Electric & Manufacturing Company and Weston Electrical Instrument Company. Among the well-known men in the electrical trade who visited the exhibits were Gerard Swope, H. A. Halligan, W. P. Sidley, A. L. Salt, O. D. Street, F. V. Bennis and E. W. Rockafellow, of the Western Electric Company; L. W. Downs, of the D & W Fuse Company; J. B. Olson, Habirshaw Wire Company; B. H. Scranton, American Electric Heater Company; Claude Matthews, W. N. Matthews & Brother; W. C. Bryant, Bryant Electric Company; W. F. Hillis, Crouse-Hinds Company; R. Edwards, Jr., Edwards & Company; George L. Patterson, Stanley & Patterson, and Samuel A. Chase, Westinghouse Electric & Manufacturing Company.

Going Ahead with Barcelona Hydroelectric Developments.—Although progress has been retarded somewhat by the unsettled conditions that have prevailed in the foreign money markets in the past few months, construction is now going forward actively on the hydroelectric developments of the Barcelona Traction, Light & Power Company, Ltd., on the Segre River, a tributary of the Ebro River, about 100 miles from Barcelona, Spain. As has been noted in these columns, this company was organized in September, 1911, under Canadian laws, by the Pearson interests, to construct and operate central-station and traction systems in Barcelona and the northeastern part of Spain. The company has an authorized capital stock of $25,000,000, all of which is outstanding. There are to be five hydroelectric stations along some 30 miles of the Segre River, each of which will have a rated output of between 50,000 hp and 60,000 hp. The heads under which they will operate will range from 50 ft. to 600 ft. Construction of the dam for the first development is now well under way, and foundation work on the dam for the second development has been started. Energy will be transmitted at 110,000 volts to Barcelona and the industrial territory surrounding it. The majority of the factories are using steam power at present. The cost of coal, it is said, is very high owing to the antiquated condition of the Spanish transportation facilities. The Pearson interests believe, therefore, that they will have very little difficulty in disposing of the low-cost energy from their hydroelectric stations under these conditions. The railroads have been a great handicap in the construction of the stations for the reason that the cars have not been large enough to transport generators, waterwheels and other heavy equipment to the developments, nor have the tunnels sufficient

clearance to permit passage of the latter had the cars been of adequate size. A large part of the equipment has been hauled by teams the greater part of the way from Barcelona. As is stated elsewhere in this issue, orders have been placed with several American steel firms for the transmission towers that will be used on this project.

Boston Edison Earnings Increasing.—The Edison Electric Illuminating Company of Boston reports gross earnings for December, 1912, of $655,562, an increase of 12.6 per cent over the same month in 1911; net earnings of $415,928, compared with $376,593 for the same period, or a gain of 10.4 per cent, and for the last six months of 1912 a gain in gross of 9 per cent, or from $2,770,126 to $3,020,126. The gain in net for the last half of the year compared with the same period in 1911 was $73,578, or 4.53 per cent, the net for the last half of 1912 being $1,698,709. The company's operating expenses for the period increased 15.4 per cent. In the field of new service applications the company is making rapid strides and is doing much work along the lines of modernizing window lighting installations besides adding constantly to its connected load. All the daily newspapers in Boston and many of the suburban weeklies are now being supplied by the Edison company with energy for lighting and motor service. In the long-hour lighting field the company is supplying many steam railroad stations, all-night restaurants, public clocks and real-estate illuminated billboards with service; and the application of its new miscellaneous rates for energy, including off-peak service, is being favorably received throughout its 600 sq. miles of territory.

English Bankers Making a Tour of American Utility Properties.—Following their arrival in New York on the *Mauretania* last Sunday, a party of eight London bankers, including E. Mackay Edgar, the active head of Sperling & Company, of London, left on a special train on Thursday for a two weeks' tour of the country for the purpose of inspecting various public utilities, some of which have been financed in part by banking houses represented by the visitors. James Mitchell, president of the Alabama Interstate Power Company, who came over from London with the party, W. W. Freeman and F. Darlington, vice-president and consulting engineer respectively of the same company, have also gone with the visitors on the tour. The itinerary includes Montreal, Toronto, Niagara Falls, St. Louis, Joplin, Denver, Keokuk, Nashville, New Orleans and Birmingham. Among the properties to be visited are those of the Utilities Improvement Company, the Cities Service Company, the Mississippi River Power Company, the Consolidated Cities Traction, Light & Power Company, the American Cities Company and the Alabama Interstate Power Company. It is understood that after their return to New York the visitors plan to inspect the public utilities of Mexico and Cuba before leaving for home.

Award Contracts for Transmission Towers.—The Blaw Steel Construction Company of Pittsburgh has received an order calling for 3000 tons of steel transmission towers from the Pearson Engineering Corporation, 115 Broadway, New York, and an order for 575 tons of towers has also been placed by the same interests with the Riter-Conley Manufacturing Company of Pittsburgh. Some of these towers will be shipped to Barcelona, Spain, where the Pearson company is constructing extensive hydroelectric developments, as noted elsewhere in this issue, and the rest will go to Brazil, where the purchasers have large central-station interests. The Blaw company has also received an order for 200 tons of transmission towers to be used by Stone & Webster at Keokuk, Ia., for the system of the Mississippi River Power Company. The Utah Power & Light Company has placed an order with Milliken Brothers, New York, for 4500 tons of steel towers.

Control of Eastern Pennsylvania Power Company May Change Hands.—A proposition to exchange their holdings for securities of the Atlantic Gas & Electric Company, a new concern that has been chartered under the laws of Connecticut with an authorized capitalization of $37,500,000, has been made to the stockholders of the Eastern Pennsylvania Power Company, which controls the gas and electric-service companies of Easton, Pa., Phillipsburg, N. J., and those in a number of other cities. It is also stated that Meikleham & Dinsmore, engineers and bankers, 25 Broad Street, New York, who have the controlling interest in the Eastern Pennsylvania company, have disposed of their holdings to the Atlantic Gas & Electric Company. A representative of Meikleham & Dinsmore said this week that the entire matter was in a formative stage as yet and that nothing of a definite nature was available for publication at this time. He admitted, however, that an exchange proposition had been made to the stockholders by the new company.

Extensions for the Tri-City Company.—The Tri-City Railway & Light Company, of Davenport, Ia., has purchased from the Westinghouse Electric & Manufacturing Company a 12,500-kw Westinghouse-Parsons horizontal turbo-generator. The generator is wound for two-phase, 4800-volt, 60-cycle current. A Westinghouse-LeBlanc surface condenser and other auxiliary equipment are included in the order. This unit is probably the largest in the country to be installed for the service of cities no larger than Davenport, Rock Island and Moline. The present rating of the company's station is 20,000 kw, and the new unit will take over a portion of the load, leaving a number of smaller machines in reserve. To accommodate the 12,500-kw machine an addition to the station will be necessary.

Changes in J. S. & W. S. Kuhn, Inc.—James S. Kuhn has resigned as president of the bond house of J. S. & W. S. Kuhn, Inc., which, as is well known, has extensive interests in the public-utility field. He has been elected chairman of the board of directors. L. L. McClelland has been elected president. W. S. Kuhn remains as vice-president, while A. B. MacCaughey, Western manager at Chicago, has been made an additional vice-president, and will continue in charge of the Western business. W. G. Audenried, manager of the Philadelphia office, has been made a vice-president, and will take charge of the company's foreign business, with headquarters in Paris.

Westinghouse, Church, Kerr & Company Engagements.—Among new work for which Westinghouse, Church, Kerr & Company are engineers and constructors is the design and construction of a power house for a hotel at White Sulphur Springs, W. Va. The building is of brick and concrete. Overhead coal bunkers, a 150-ft. steel stack and mechanical stokers are being erected. A large amount of general engineering work, including bridges, piers and railroad extensions, is being carried on at the present time by these engineers.

To Consolidate Four Maryland Companies.—Plans for the consolidation of the Frederick (Md.) Railroad Company, the Hagerstown (Md.) Railway Company, the Frederick & Hagerstown Power Company and the Frederick Gas & Electric Company are being completed. Between $3,000,000 and $4,000,000 will be represented in the merger. Extensive improvements are to be made to the various systems.

H. W. Johns-Manville Company's Annual Meeting.—A resolution reducing the number of directors from nine to seven was approved at the annual meeting of the H. W. Johns-Manville Company. The retiring directors, with the exception of George W. Gladwin, were re-elected. A vacancy that already existed on the board reduced its members to the required number.

Central Colorado Power Reorganization.—Announcement has been made by the reorganization committee of the Central Colorado Power that, since more than 85 per cent of the outstanding bonds affected by the reorganization plan have been deposited with it, steps will be taken immediately to foreclose on the mortgage, sell the properties and organize a new company.

New Plant for Pacific Power & Light.—Construction of a new 7000-hp hydroelectric station for the Pacific Power & Light Company has been started at Hood River, Ore., where the company now has a small station in operation. A transmission line will be built from The Dalles to Pendleton. The Pacific Power & Light is controlled by the Electric Bond & Share Company.

Detroit Edison Stock Issue Approved.—Directors of the Detroit Edison Company have authorized the issuance of $3,000,000 new stock to stockholders at par to the amount of 30 per cent of their present holdings.

Discredit New Rumor of Big Pacific Coast Merger.—Negotiations have been in progress for some time between the city officials of Los Angeles, Cal., and the Southern California Edison Company, the Los Angeles Gas & Electric Company and the Pacific Light & Power Company to determine whether or not these central-station companies, which now serve that city, shall be allowed to purchase all of the energy to be generated by the hydroelectric station which has been erected in connection with the city's aqueduct project, or whether the companies shall sell their distribution systems in Los Angeles to the city so that the latter can distribute the energy generated at the aqueduct plant. It is understood that the municipal ownership of the electric-service properties is greatly favored by the people of Los Angeles. The City Council recently voted unanimously to reject several propositions submitted by the companies. Adoption of any of these propositions, the City Council held, would mean further delay in the establishment of a municipal system. Further efforts are to be made by the city to purchase the distribution systems outright. Founded probably upon this controversy, the old rumor in financial circles that the three companies are to be merged into one large concern capitalized at about $100,000,000, with a view to thwarting by this amalgamation and its effect upon the bond markets any attempts that the city may make to finance its municipal project, has been revived. New York banking interests that have participated extensively in the financing of California public utilities did not take the rumor seriously when it was called to their attention this week. "This rumor is heard every so often upon the slightest provocation," said one man, "and, as you know, it has been heard frequently in the past few years. Sentiment in Los Angeles is very strong for municipal operation of the public utilities and the negotiations that are now being carried on between the city and the companies are undoubtedly the basis of the present revival of the merger rumor. I doubt very much whether such a merger would even be attempted now that California utilities are under commission regulation. Whether or not the companies have simply entered into some form of agreement in order to promote concerted action by them in the present municipal controversy, is, of course, a different matter."

Geographical Distribution of Capital Stock.—According to an analysis that has just been completed by Hodenpyl, Hardy & Company, of New York, the Commonwealth Power, Railway & Light Company, of Jackson, Mich., had 3363 stockholders on Oct. 1, 1912, who were distributed throughout thirty-five states and eight foreign countries. The name of this company appeared recently in a list of properties which, it was said, were controlled by J. P. Morgan & Company, and the analysis was conducted with a view to showing that control of the Commonwealth company is not vested in any individual or firm. The total amount of stock in the hands of the public is $25,144,000, of which $12,000,000 is common and $6,000,000 preferred stock of the Commonwealth company, $5,000,000 is preferred stock of the Consumers' Power Company, and $2,144,000 is preferred stock of the Michigan Light Company, its subsidiaries. From the analysis, part of which is given below, it appears that nearly one-third of the capitalization is held in Michigan, that one-fourth is held in Pennsylvania, that about one-eighth is held in Rhode Island, and a similar amount in New York. In twenty-six states and the eight foreign countries less than 1 per cent. of the total capitalization is held. The distribution in the other nine states is shown as follows:

State.	No. of Stockholders.	Per Cent.	Capitalization Held.	Per Cent.
Michigan	932	27.71	$7,950,800	31.62
Pennsylvania	540	16.06	6,128,300	24.37
New York	246	7.31	3,844,600	15.29
Rhode Is'and	598	17.78	3,242,200	12.89
Kentucky	230	6.84	1,174,300	4.67
Ohio	158	4.70	797,700	3.17
Connecticut	247	7.35	646,500	2.57
Massachusetts	105	3.12	264,100	1.05
Illinois	43	1.28	192,300	.76

Ozark Power & Water Development Nearing Completion.—T. O. Kennedy, engineer in charge of the construction corps which is building the Ozark Power & Water Company's 15,000-hp hydroelectric station on the White River near Branson, Mo., says in a report to the Doherty Operating Company that previous estimates as to the date of completion of the various portions of the work have been confirmed and that the power station, together with the transmission lines, will be ready for operation by May 1, 1913. The dam is now 98 per cent completed, the power house is 80 per cent completed, the power house equipment has been shipped by the manufacturers, and the 80-mile transmission line between Joplin and Springfield has also been completed, together with the substations at Joplin, Diamond and Springfield. The wood-pole line extending 30 miles south from Springfield is ready for wire and the private right-of-way for the remainder of that line, about 15 miles, is being cleared preparatory to the erection of steel towers which are now being delivered. Details of the plans of the Ozark Power & Water Company appeared in the *Electrical World*, Feb. 24, 1912.

Kellogg Switchboard & Supply Declares Stock Dividend.—Stockholders of the Kellogg Switchboard & Supply Company, Chicago, have authorized an increase in the capital stock from $1,000,000 to $2,000,000. The directors have authorized a stock dividend of 25 per cent and have also declared the regular quarterly dividend of 3 per cent, payable Feb. 3 to holders of record Jan. 31.

Great Western Power Financing.—Application has been made to the California Railroad Commission by the Great Western Power Company for authority to issue first mortgage 5 per cent forty-year bonds to an amount sufficient to yield $3,971,731. The proceeds are to be used to extend its system. The Feather River dam is 40 per cent completed. The cost of work on it thus far has been about $870,000.

Doubling Output of Station at Sao Paulo, Brazil.—The Sao Paulo (Brazil) Tramway, Light & Power Company, Ltd., is now installing equipment in its hydroelectric station that will double the present rated output of 30,000 hp.

Industrial Securities

Security	Capital Stock Listed	DIVIDEND		QUOTATION	
		Per Cent	Period	Jan. 15	Jan. 22
Allis-Chalmers, 3d assess. paid	$17,151,100	.....	.....	1⅛	3⅛
Allis-Chalmers, pf., 2d assess. paid	14,034,700	.....	.....	4½	10*
Amalgamated Copper	153,887,900	1	Q	72½	75¾
American Tel. & Tel.	334,712,300	2	Q	134½	133½*
Electric Storage Battery,c.	16,074,425	1	Q	53	53
General Electric	77,726,700	2	Q	182*	142½
Mackay Cos., c	41,380,400	1½	Q	85	85*
Mackay Cos., pf	50,000,000	1	Q	67⅛	67½*
Western Union Tel.	79,943,400	¾	Q	71	71½
Westinghouse, E. & M., c.	31,685,300	1	Q	73¾	74¾
Westinghouse, E. & M., pf.	3,998,700	1¾	Q	121½*	121½*

*Last price quoted.

NEW YORK METAL MARKET PRICES

	Jan. 14 Bid.	Jan. 14 Asked.	Jan. 21 Bid.	Jan. 21 Asked.
Copper:				
Standard, spot	15.25	.....	15.25	.....
	£ s d		£ s d	
London, standard, spot	69 17 6		68 17 6	
Prime Lake	16.75 to 17.00		16.25	
Electrolytic	16.50 to 16.75		16.00	
Casting	16.25 to 16.50		15.87½	
Copper wire, base	19.00		18.00 to 18.25	
Lead	4.35		4.35	
Nickel	45.00		45.00	
Sheet zinc, f.o.b. smelter	9.00		9.00	
Spelter, spot	7.35		7.25	
Tin, spot	50.80		50.00	
Aluminum:				
Prompt delivery	25.75 to 26.25		25.75 to 26.25	
Future	25.50 to 26.00		25.50 to 26.00	

OLD METALS

Heavy copper and wire	15.50	14.25
Brass, heavy	9.50	8.75
Brass, light	8.00	7.75
Lead, heavy	4.15	4.15
Zinc, scrap	6.12½	6.12½

COPPER EXPORTS IN JANUARY

Total tons to	Jan. 15, 12,020	Jan. 22, 16,483

Personal

Mr. F. W. Insull, general auditor of the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., has resigned, to accept another position.

Mr. Alban W. Mann, of Elgin, Ill., has been appointed supervising engineer of the seventy-eight plants of the Central Illinois Public Service Company, of Mattoon, Ill.

Mr. L. V. Webber, chief of the meter department of the Toronto Electric Light Company, has resigned his position to become sales manager for the Metropolitan Engineering Company.

Mr. P. A. Bertrand, manager of the Jefferson City (Mo.) Light, Heat & Power Company, has tendered his resignation, effective Feb. 1, and will take up elsewhere his work of building up plants.

Mr. Quincy W. Hershey has resigned as president of the Avon (N. Y.) Electric Company and as general manager of the Livingston-Niagara Power Company and the Corporations Service Company.

Mr. Albert C. Moore, consulting engineer, of Joplin, Mo. has been retained as engineer to supervise the planning and erection of the new water-works and electric light plant for the city of Sulphur Springs, Ark.

Mr. James B. Goodwin, recently superintendent of construction and assistant general manager of the Mount Hood Railway & Power Company, Portland, Ore., has been appointed construction engineer for the city of Edmonton, Alberta.

Mr. R. W. Williamson, for the past three years city electrician of Shreveport, La., and local representative of the Louisiana Fire Prevention Bureau, has tendered his resignation and accepted a position with the Alabama Power Company.

Mr. N. I. Garrison, for many years auditor of the Fort Smith (Ark.) Light & Traction Company, has been transferred to a similar position with the Western States Gas & Electric Company, Stockton, Cal., which is controlled by the same syndicate.

Mr. F. K. Woodring, contract agent of the People's Incandescent Lighting Company, Meadville, Pa., and formerly connected with the Titusville (Pa.) Electric Light & Power Company, has resigned and accepted a position with the West Penn Electric Company, Connellsville, Pa.

Mr. Heinrich Homberger, consulting engineer, of San Francisco, has been appointed advisory engineer for hydraulic plant equipment by the Oro Electric Corporation, Oroville, Cal., in connection with its proposed 40,000-kva. power plant on the north fork of the Feather River.

Mr. W. J. Barker, second vice-president and general superintendent of the Denver (Col.) Gas & Electric Light Company, was elected a director of the Colorado Electric Club on Jan. 9. The club has 727 members and is identified with every large civic or commercial movement in Denver.

Mr. P. D. Kline has resigned as general superintendent of construction of the Falkenau Electrical Construction Company of Chicago to accept the position of general superintendent of the Ogden and Logan (Utah) Rapid Transit Companies, effective Feb. 1, 1913, with offices in Ogden, Utah.

Mr. F. John Bell has resigned as general manager of the British Canadian Power Company, Cobalt, Ontario, as the outcome of the amalgamation with the Northern Ontario Light & Power Company. He has been appointed general manager of the Canada Wire & Cable Company, Toronto, Ontario.

Mr. R. T. Jeffery, for some years associated with the electrical department of Messrs. Smith, Kerry & Chace, Toronto, Ont., has resigned to engage in general engineering work with the Hydro-Electric Power Commission of Ontario, in connection with its extensive work among the various municipalities.

Mr. A. W. Bush, of Mendota, Ill., has been appointed manager of the properties of the Illinois Northern Utilities Company at Sterling, Ill., to succeed Mr. T. R. Woulfe, resigned, effective Feb. 1. Mr. J. W. Lasher, who has been manager for the company at Morrison, Ill., has been transferred to Mendota.

Mr. H. W. Soderling, manager of the Wenatchee Valley Gas & Electric Company, has resigned his position and purchased stock in the Bliss Electric Company, of Wenatchee, Wash., becoming its vice-president and sales manager. Mr. Louis Shreve will succeed Mr. Soderling as manager of the Wenatchee Valley company.

Dr. Carl Hering delivered a lecture on Jan. 13 before the engineering students of the University of Virginia on electrochemistry and electrometallurgy, in the course of which he sketched some of the latest advances in these branches and dwelt on the great possibilities of the future, mentioning many problems awaiting solution.

Mr. Edwin M. McClintock, superintendent of stations of the Union Gas & Electric Company of Cincinnati, and Mr. William F. Vance, chief electrician of stations, have resigned to accept positions with the Superior Carbon Specialty Company, of that city. They have both been connected with the company more than nineteen years.

Mr. W. N. Smith, who last year was consulting engineer for the Washington & Old Dominion Railroad, Washington, D. C., and electrified that line, and who previously was electrical engineer with Westinghouse, Church, Kerr & Company, has just become connected with the construction department of the Edison Electric Illuminating Company of Boston, Mass.

Mr. R. E. Bowen, who for some time has been industrial engineer of the Livingston-Niagara Power Company, Avon, N. Y., has been appointed manager for the Avon Electric Company, Lima-Honeoye Light & Railroad Company, Livonia Light & Heat Company, Livingston-Niagara Power Company and the Corporations Service Company, succeeding Mr. Q. W. Hershey, resigned.

Mr. H. G. Kislingbury, formerly of the auditor's department of the Union Electric Light & Power Company, St. Louis, Mo., has joined the staff of the Hodenpyl-Hardy Company, Jackson, Mich., to study rate schedules and compile rate data for its various companies. Mr. Kislingbury was a 1908 graduate of the University of Wisconsin, from which he later received his E. E. degree.

Mr. William C. Andrews, of New York, who was recently appointed alternate statesman of the Jovian Order, is interesting electrical men in a lew lodge of the Arabian Lords of the American Desert now being organized in New York. The Arabian Lords is a fraternal organization whose members must also be members of some other recognized secret organization, and Mr. Andrews has secured for it the recognition of the Jovian Order.

Mr. J. M. Dewberry, who has been vice-president of the Birmingham, Ensley & Bessemer Railway, Birmingham, Ala., has severed all his official relations with the company, which is commonly known as the Tidewater line, but has not resigned from the Tidewater Power Company or retired from participation in the development of the other features of the general Tidewater enterprises, which include the construction of a power plant on the Warrior River to furnish electricity for light and power purposes in Birmingham and the construction of a railway from Birmingham to the Warrior River.

Mr. John L. Fay has resigned his position as superintendent of wire for The Milwaukee Electric Railway & Light Company to enter commercial and development work in connection with patents recently granted him. A farewell dinner was tendered Mr. Fay on his departure, Jan. 15, by the electrical distribution department of the Milwaukee company, Mr. G. C. Post, electrical engineer for the company, presiding. As a token of regard the guest was also presented by his associates with a diamond-studded gold model of the clamp insulator device invented by him, mounted as a scarf-pin.

Mr. John L. Putnam, who for the past sixteen years has been in the telephone business and for nearly all of that time with the Bell system, has joined the banking organization of Kennett Cowan & Company of New York and Chicago. Mr. Putnam graduated from the electrical engineering course of the Massachusetts Institute of Technology in 1896, and because of his long connection with the Bell interests and his former association with the manufacturers of the Clark automatic system, is widely known

among telephone men throughout the country. He will make his headquarters in Chicago.

Mr. Claxton E. Allen, who has been closely identified with the transformer industry in various capacities for the past ten years, has been appointed assistant manager of the detail and supply department of the Westinghouse Electric & Manufacturing Company, having been previously head of the transformer division of that department. Mr. Allen is a Virginian and a graduate of the Virginia Polytechnic Institute. In 1901 he took the apprentice course of the General Electric Company and then entered the engineering department of that company, where he was engaged in the design of transformers. While there he invented the distributed-core-type transformer and then entered the commercial department of the company, where he remained until 1909, when he entered the employ of the Westinghouse Electric & Manufacturing Company as head of the transformer division of the detail and supply department.

CLAXTON E. ALLEN.

Mr. Thomas F. Kelly, contract agent of the Dominion Power & Transmission Company, of Hamilton, Ont., has been appointed sales manager of the Dayton (Ohio) Power & Light Company. Mr. Kelly is regarded as one of the best posted men in Canada on electrical matters, and his ability has won for him rapid advancement. He began as a junior clerk with the Dominion Power & Transmission Company in 1900, and after becoming experienced in various departments was appointed contract agent in 1908. Aside from his work with the company, Mr. Kelly has taken an active interest in all movements tending toward Hamilton's advancement. He was secretary of the Hamilton Ad Club, and is president of the local section of the National Electric Light Association and a member of the commercial committee of the Canadian Electric Association.

Mr. Charles R. Huntley, president of the Buffalo General Electric Company and director in the Buffalo & Niagara Falls Electric Light & Power Company and in the Cataract Power & Conduit Company, rounded out a quarter of a century of affiliation with the light and power interests of Buffalo, N. Y., on Jan. 15, and his associates tendered him a dinner at the Buffalo Club, where he was presented with a silver loving cup. In addition, Mr. Huntley was the recipient of numerous congratulatory telegrams from his many friends in the industry in all parts of the country. Mr. Huntley, who is one of the pioneers in the central-station field, was born in Winfield, N. Y., Oct. 12, 1854. He was graduated from the Utica Academy and after entering a hardware firm subsequently became identified with the firm of Remington & Sons, manufacturers of guns and typewriters. Late in the 70's he settled in Buffalo and in 1878 became general agent of the Standard Oil Company of Pennsylvania. From 1883 to 1888 he conducted a brokerage business in Bradford, Pa., and in 1888 he returned to Buffalo as the representative of the Standard Oil Company to look after its interests in the Brush Electric Light Company, which subsequently became the Buffalo General Electric Company. Mr. Huntley's success is attributable to his knowledge of human nature, his business keenness and his ability to handle men. He possesses a pleasing personality and has been identified with progressive movements in Buffalo, of which he is a prominent citizen. Of late years he has not enjoyed the best of health, but he is fast regaining his vitality. In 1891-1892 Mr. Huntley was president of the National Electric Light Association, in which he has always taken an active interest. He has also been prominent in the affairs of the Association of Edison Illuminating Companies.

CHARLES R. HUNTLEY

Obituary

Ralph Withington, president of the American Insulating Machinery Company, of Philadelphia, died at his residence in that city on Dec. 31, after a brief illness. Mr. Withington, who was born in Bolton, England, came to this country at an early age and had been engaged in the manufacture of machinery and appliances for the production of covered wire for many years, his experience in this line antedating the general use of insulated wire in the electrical field.

Francis Blake, inventor of the telephone transmitter bearing his name, died at Weston, Mass., on Jan. 19. He was a native of Needham, Mass., and was educated in the Brookline High School. In 1866, at the age of sixteen, he received an appointment to the United States Coast Survey, where he remained until 1878, when he resigned. The Blake transmitter was invented in 1878, and ever after Mr. Blake interested himself in the development of the telephone. He presented to the medical profession an improved form of the rotary microtome which has been adopted in many of the leading pathological and biological laboratories of the country. His telephonic inventions number nineteen, five relating to the original Blake transmitter, its details and refinements, five to improvements in transmitters with special reference to the granular carbon type, eight to forms of telephone switchboards, and one to selective signals for party-line service. The original transmitter patent of Mr. Blake was taken out as a result of his reading the deliberations of the Physical Society and the Royal Society upon the Hughes microphone at a meeting in 1878, a similar discussion having been held by the Society of Telegraph Engineers at about the same time, led by Sir William H. Preece. The essential feature of the Blake transmitter was the use of a light contact in a telephone circuit, which while remaining light would never break, and the fundamentals of the apparatus consisted of a platinum pin pressed by a light spring against a spring-suspended button of gas carbon. This transmitter was used solely by the Bell telephone interests until about 1886, when it was superseded by the granular carbon instrument of the Hunning type as refined and developed by the experts of the company. In the field of invention, however, Mr. Blake was always a "free lance," although he was a director of the American Telephone & Telegraph Company. His social affiliations were numerous, and he was a member of the American Academy of Arts and Sciences and the American Institute of Electrical Engineers, a fellow of the American Association for the Advancement of Science, a member of the National Geographical Society, a member of the corporation of the Massachusetts Institute of Technology, a trustee of the Massachusetts General Hospital and the Boston Museum of Fine Arts, a member of the Boston Society of Civil Engineers and various historical organizations. At the last meeting of the Association of Telephone Pioneers he was elected an honorary member, the only other member of this class being Dr. Alexander Graham Bell. Mr. Blake is survived by his widow, a son, daughter, sister and brother.

FRANCIS BLAKE

Construction

SULPHUR SPRINGS, ARK.—The city of Sulphur Springs has engaged Albert C. Moore, consulting engineer, Joplin, Mo., to prepare plans and supervise the construction of the new electric-light plant and waterworks system. The cost of the work is estimated at about $40,000.

BEAUMONT, CAL.—The Southern California Edison Co. has filed a petition with the Board of Trustees of Beaumont asking for a franchise to operate an electric system here.

FRESNO, CAL.—The San Joaquin Lt. & Pwr. Co. has awarded a contract to J. G. White & Co., of New York, N. Y., to design and install a 5000-hp hydroelectric plant on the Tule River. A large part of the hydraulic work is completed.

FRESNO, CAL.—The contract for the construction of a power plant for the Fresno, Hanford & Summit Lake Interurban Ry. Co., of Fresno, has been awarded to the General Electric Co. The plant will have an output of about 3000 hp and will be located between Lone Star and Fowler. The cost of the plant is estimated at about $100,000.

HOLLISTER, CAL.—Plans are being prepared by the Central California El. Ry. Co. to extend its electric railway from San Juan to Hollister, a distance of about 8 miles. Storage-battery cars may be used.

LODI, CAL.—We are informed that the Western States Gas & El. Co. does not contemplate the installation of a distributing system in Lodi as reported in the issue of Jan. 4. The company sells electricity to the town of Lodi, which is distributed by the municipal electric-light plant.

LOS ANGELES, CAL.—The Los Angeles Ry. Corpn. has applied to the City Council for a franchise to build a double-track electric railway on Mission Road.

LOS ANGELES, CAL.—The Board of Public Works has awarded the contract for the construction of the "relief" line on San Pedro Street between Aliso Street and Ninth Street to the Pacific El. Ry. Co., for $246,575.

LOS ANGELES, CAL.—The Pacific El. Ry. Co. has applied to the State Railroad Commission for permission to issue bonds to the amount of $7,034,000, the proceeds of $6,585,682 to be used for improvements already under way, the proceeds of $1,724,230 to be used for new work. The projected improvements cover the principal lines of the company in southern California.

LOS ANGELES, CAL.—The Southern California Edison Co., of Los Angeles, has applied to the State Railroad Commission for permission to issue $2,500,000 in bonds, the proceeds to be used for improvements, which include the enlargement of the Long Beach plant at a cost of about $1,500,000, stations in Los Angeles, the construction of new substations, extensions to the distributing system and general improvements throughout the entire system.

ORANGE, CAL.—The City Trustees are considering plans for the installation of a fire-alarm system.

REDLANDS, CAL.—The Southwest El. Co., of Redlands, has been awarded the contract for the installation of an ornamental street-lighting system in Redlands, at $9,668.

RICHMOND, CAL.—The Western States Gas & El. Co., of Richmond, is erecting an electric transmission line to connect with the Union Water Company's pumping station at San Pablo.

SAN FRANCISCO, CAL.—The City El. Co. has applied to the State Railroad Commission for permission to issue $833,000 in bonds, the proceeds to be used for improvements.

UPLANDS, CAL.—The installation of an ornamental street-lighting system on Second Street is under consideration.

WILLOWS, CAL.—The Board of Supervisors of Glenn County has granted the petition of the Oro Lt. & Pwr. Co., of Oroville, for a franchise to operate in Willows.

BOULDER, COL.—All bids submitted Dec. 30 for the construction of a municipal electric-light plant were rejected. It has not yet been decided when new bids will be called. O. P. Clark is city clerk.

MONTROSE, COL.—The property of the Montrose El. Lt. & Pwr. Co. has been purchased by Carl J. Sigfrid and E. A. Phinney, of Ouray, representing the Utah Pwr. & Lt. Co. This will form part of the light and power system, which is to extend from Durango to Salt Lake City. A branch will run from Grand Junction to Leadville and Salida.

HARTFORD, CONN.—The Hartford El. Lt. Co. has announced plans for the erection of a new seven-story office building, to cost $200,000, on the site of its present small plant in Pearl Street. It will have a frontage of 130 ft. and a depth of 100 ft.

HARTFORD, CONN.—Prizes for the best design for ornamental lamp standards to be used in connection with the improved lighting system for the center of the city were awarded to Chester B. Price, architect, New York, N. Y. There are three standards—one three-lamp standard, one two-lamp standard and single lamp wall bracket. The wall bracket is intended to be attached to buildings on narrow streets.

MONTVILLE, CONN.—The New London Gas & El. Co. has decided to extend its electric-lighting service to Montville and expects to supply electricity for lighting the town within three months.

WASHINGTON, D. C.—Plans are being prepared by the district electrical engineer for the installation of a new street-lighting system on Pennsylvania Avenue from the United States Treasury Building to the Capitol.

WASHINGTON, D. C.—Sealed bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 11 for furnishing at the Boston (Mass.) navy yard one storage-battery truck, type M, as per Schedule 5134.

WASHINGTON, D. C.—Proposals will be received at the office of the Commissioners of the District of Columbia, Washington, D. C., until Jan. 28 for construction of extension to ward building and dining room, including the installation of conduits, wires and fixtures for an electric-lighting system at the Home for Aged and Infirm at Blue Plains, D. C. Blank forms, specifications and other information may be obtained from the chief clerk, Engineer Department, Room 427, District Building, Washington. Separate proposals may be submitted for electric lighting system. A deposit of $10 will be required to guarantee the returns of plans.

WASHINGTON, D. C.—Proposals will be received at the office of the chief signal officer, War Department, Washington, D. C., until Feb. 1 for furnishing material under proposal No. 635 as follows: (1) Three power switchboards and distributing frames for signal corps switchboard rooms, in accordance with specifications Nos. 571, 368-a and 560; (2) two telephone power switchboards, type No. 1, in accordance with specifications Nos. 560, 519-c and 403-a; (3) two telephone power switchboards, type No. 4, in accordance with specifications Nos. 560, 519-c and 403-a; (4) two cabinet terminals, as per specifications Nos. 435-b, 368-a and 560; (5) two panels, station switch, with six-pole switch, in accordance with specifications No. 415-c and addenda specification No. 368-a. Captain W. L. Clarke is disbursing officer.

AMERICAN FALLS, IDAHO.—The American Falls Pwr. Co. has completed the construction of a dam across the Snake River at American Falls and will soon begin on the installation of a hydroelectric power plant which will develop 4000 hp. A. J. Wiley is chief engineer.

BUHL, IDAHO.—I. B. Perrine contemplates building an electric line from Buhl to Castleford, a distance of 11 miles.

CLARKSTON, IDAHO.—F. L. Strum has been granted a franchise to build an electric line from Clarkston to Asotin, via Vineland. Surveys are now being made and construction work will soon begin.

SHELLEY, IDAHO.—The Utah Pwr. & Lt. Co. has purchased the plant and holdings of the Gem State Lt. & Pwr. Co. in Shelley, for a consideration of $200,000. The new company will increase the output of the plant to 10,000 hp. It will enter the Blackfoot field and extend its lines into the territory on the west side of the river.

BRYANT, ILL.—The Village Board has granted the Canton Gas & Lt. Co., of Canton, a franchise to operate an electric-light system in Bryant.

DUNDEE, ILL.—The Village Boards of East Dundee and West Dundee have entered into a contract with the Public Service Co. of Northern Illinois, of Chicago, for street lighting. The company will furnish 40-cp tungsten lamps on a moonlight schedule, at $15 each per year. The Council at Carpentersville has also awarded a contract to the company for street lighting.

GALVA, ILL.—The Hayes Pump & Corn Planter Co. has applied to the City Council for a franchise to operate an electric-light plant in Galva. The Galva Gas Lt. & Coke Co. is also seeking a franchise to operate an electric-light system here. In addition a committee of citizens has become interested with Galesbury residents in a plan to transmit power from the dam of the Mississippi River Pwr. Co. at Keokuk, Ia.

HAMMOND, ILL.—E. B. Leavitt, owner of the city garage, is installing an electric-light plant to supply electricity for lighting the town. The equipment will include two oil engines, Olds and Fairbanks; General Electric generator, 4 miles of overhead material. The street-lighting system will consist of forty 100-watt incandescent lamps. Contracts have been placed for all equipment and material.

HANNA CITY, ILL.—The People's El. Service Co., which has a power plant at Framington, has applied for a franchise to operate an electric-light system in this city. The line will also supply electrical service in Trivoli and Eden.

LACON, ILL.—The Public Service of Northern Illinois is preparing to rebuild its transmission lines in Lacon, work on which will begin as soon as the weather permits. The wires will be placed underground in the business section. New lamps will also be installed.

MARINE, ILL.—Application has been made to the Village Board by John Hauge, of St. Louis, for a 20-year franchise to install and operate an electric-light system in Marine. It is proposed to use 40 large tungsten lamps for lighting the streets.

MENDOTA, ILL.—The Illinois Northern Utilities Co., of Chicago, it is reported, will erect a transmission line from Clinton, Ia., to Mendota, next spring.

METROPOLIS, ILL.—The Water and Light Department has placed orders with A. L. Ide & Sons, of Chicago, Ill., and the Westinghouse El. & Mfg. Co., of Pittsburgh, Pa., for a 100-kva, three-phase, 60-cycle, 2300-volt generating unit, direct-connected. It is expected to have the unit ready for service by March 15, at which time a day service will be established. P. M. Richards is superintendent of the Water and Light Department.

MOLINE, ILL.—Contracts have been awarded by the People's Pwr. Co. for the installation of an additional 12,500-volt generating unit at its power plant at the foot of Fourth Street. The power house will also be enlarged. The cost of the entire work is estimated at about $200,000.

MURRAYVILLE, ILL.—The Village Board has granted the Central Illinois Pub. Ser. Co., of Mattoon, a franchise to operate an electric-light system here. Electricity is to be transmitted from Roodhouse and the system must be installed by Jan. 1, 1914. Residents of Manchester are circulating a petition to have the Central Illinois Pub. Ser. Co. erect a line to that place.

OAK PARK, ILL.—The Village Board is considering the question of improving the street-lighting system. August Einfelt is president of the board.

PEORIA, ILL.—The highway commissioners of Groveland Township have granted the Peoria Gas & El. Co. permission to use the highways for an electric transmission line from East Peoria to Wesley City.

THOMASBORO, ILL.—The Village Board is contemplating the installation of an electric-light system here.

TUSCOLA, ILL.—The Central Illinois Pub. Ser. Co., of Mattoon, is preparing to erect a transmission line between Tuscola and Arcola to supply the latter city with electricity for lamps and motors. The line will also supply electricity to the Reuple elevator and for commercial and residential lighting in Galton.

TUSCOLA, ILL.—The county officers of Douglas County and residents of Tuscola have presented a petition to Fred C. Rahn, chairman of the Board of County Supervisors, requesting him to call a special meeting of the County Council to consider the construction of a county electric-light plant. The Central Illinois Pub. Ser. Co. has been furnishing light and heat for the building.

BROAD RIPPLE, IND.—The Town Board has canceled its contract for street lighting with the Indianapolis Lt. & Ht. Co., of Indianapolis, alleging that the company has failed to live up to its contract. The town will contract with the Merchants' Lt. & Ht. Co., of Indianapolis, to light the streets of the town.

COLUMBUS, IND.—The Central Indiana Ltg. Co., of Columbus, has applied to the County Commissioners for a franchise to extend its transmission lines into East Columbus to supply electrical service there. F. D. Potter is local manager.

ELKHART, IND.—The Home Tel. Co. is planning to erect an exchange building in Elkhart, to cost about $65,000.

EVANSVILLE, IND.—The electric plants in Evansville, Princeton, Petersburg and other towns along the Ohio, White and Patoka Rivers in southern Indiana have been badly damaged by floods. Extensive repairs will be necessary when the floods subside.

GOSHEN, IND.—The City Council has engaged Burns & McDonnell, of Kansas City, Mo., to prepare plans and specifications for the reconstruction of the municipal electric-light plant.

RICHMOND, IND.—The Board of Public Works has decided to make improvements to the municipal electric-light plant to cost from $65,000 to $70,000. The work will include a large addition to the power house and the installation of a generator, engine and boilers, with condenser, pumps, etc.

SILVER LAKE, IND.—The capital stock of the People's Mutual Tel. Co. has been increased from $10,000 to $30,000.

WASHINGTON, IND.—The City Council has notified the owners of the local electric-light plant of its intention to purchase and take over the plant at the expiration of the present franchise in June. It is understood that improvements will be made to the plant.

WILLIAMSPORT, IND.—The Town Board is contemplating improvements to the municipal electric-light plant, involving an expenditure of about $10,000.

CLINTON, IA.—The Clinton St. Ry. Co. and the Clinton Gas Lt. & Coke Co., it is reported, will ask the City Council for a 25-year combination franchise. The extension of the franchise will carry with it, it is said, permission to build a line to the southwestern part of the city and one on Hickory Street.

FORT MADISON, IA.—The Stone & Webster Management Association has entered into an agreement with the Fort Madison El. Lt. & Pwr. Co. to purchase the property of the latter, provided the City Council will grant the company a new franchise covering a period of 25 years.

GILBERTVILLE, IA.—The officials of the Waterloo, Cedar Falls & Northern Ry. Co. have submitted a proposition to the town of Gilbertville offering to install an electric-light system and furnish electricity at 12 cents per kw-hr. This price is generally considered too high and a company may be organized by the local business men to install and operate an electric-light plant. M. Delagardelle, of Gilbertville, is interested in the project.

IOWA CITY, IA.—The Iowa City El. Ry. Co. has been reorganized under the name of the Mississippi Valley El. Co. and its capital stock increased from $100,000 to $1,450,000. Under the new organization the company has the right to extend its business to any part of the State. The new company will operate electric-lighting systems as well as street railways. J. O. Schulze is president of the company and D. A. Reese secretary and treasurer.

MOUNT AYR, IA.—The Mount Ayr Lt. & Pwr. Co. is planning to install a new boiler, engine and generator this summer.

MUSCATINE, IA.—Merchants on Second Street between Iowa Avenue and Chestnut Street have agreed to install ornamental street lamps.

PRINCETON, IA.—The voters of the village have approved a proposition to grant the Illinois & Iowa Ry. Co. a 25-year franchise to supply electricity for lamps and motors in Princeton. The company has purchased the municipal electric-light plant.

SIOUX CITY, IA.—The Sioux City Tel. Co. has announced that it will do a large amount of underground and aerial cable work and install additional plant equipment. Howard S. Baker is general manager.

FORT SCOTT, KAN.—The City Council has adopted a resolution advocating the installation of a municipal electric-light plant.

PARSONS, KAN.—The city commissioners have called an election to be held Feb. 11 to submit the proposition to issue $75,000 in bonds to construct a municipal electric-light plant to a vote.

HOPKINSVILLE, KY.—Plans have been prepared by the Kentucky Pub. Ser. Co. for improvements to its local plant involving an expenditure of about $100,000.

LOUISVILLE, KY.—The Louisville Ltg. Co. is contemplating extending its transmission lines to Fern Creek, a suburb of Louisville.

SHELBYVILLE, KY.—The Shelby fiscal court has approved the franchise granting the right to erect electric transmission lines along the roads and highways of Shelby County to supply electricity for lamps and motors to the farmers, which was applied for by John K. Tood, of Shelbyville, representing the Kentucky Utilities Co. This company recently purchased the plant of the Shelbyville Wtr. & Lt. Co. to be sold to the highest bidder on Jan. 25. The franchise is for a period of 25 years. It is said that the company proposes to extend its lines to all parts of the county.

WILLIAMSTOWN, KY.—J. M. Riley, of Williamstown, is contemplating the installation of an electric-light plant here, and plans have been prepared.

BATON ROUGE, LA.—The Baton Rouge El. Co. has accepted the franchise offered by the city for the extension of the street-car line out Florida Street, down East Boulevard to Railroad Avenue. Work will begin at once on construction of the railway.

LAFAYETTE, LA.—The electric light committee has authorized Engineer Raymond to prepare specifications for the installation of new boilers and generators and for changing the system from direct to alternating current. The cost of the work is estimated at about $40,000. Bids will be called for as soon as plans are ready.

LAKE CHARLES, LA.—The Louisiana Trac. & Pwr. Co. is making arrangement to extend its interurban electric railway from Lafayette to Alexandria. The company is also said to be negotiating for the car lines of the Alexandria St. Ry. Co.

NAPOLEONVILLE, LA.—An election will be held Feb. 18 to submit the proposition to appropriate $22,000 for the installation of a municipal electric-light plant to a vote.

AUGUSTA, MAINE.—The Fruitvale Land, Lt. & Wtr. Co. has been organized at Augusta for the purpose of developing land and owning and operating electric-lighting and power plants. The company is capitalized at $200,000. E. M. Leavitt, of Winthrop, is president and treasurer.

BARNSTABLE, MASS.—Sealed proposals will be received at the office of the County Commissioners at the Court House, Barnstable, until Feb. 1 for lighting the court house, jail and county grounds at Barnstable by electricity. Alfred Crocker is clerk.

BLACKSTONE, MASS.—The plant of the Blackstone El. Lt. Co. has been sold by the Stone & Webster interests to C. D. Parker, of Boston, Mass. The new owners will take possession at once.

BOSTON, MASS.—The South Boston Citizens' Association is considering the question of installing a new lighting system on Broadway in South Boston. The cost of the system is estimated at about $15,000.

CARNEY, MICH.—The State Railroad Commission has authorized the Neadeau Township Tel. Co. to organize and issue $1,000 in capital stock. The company will operate in Nadeau Township and the exchange will be located at Carney.

CHEBOYGAN, MICH.—At a special election held recently the Cheboygan El. Lt. & Pwr. Co. was granted a franchise. The company has promised to expend several thousand dollars in improvements to its plant and to build an electric railway to Petoskey within five years. The company recently purchased the plant at Pellston, which will provide power for the western end of the proposed railway.

COMSTOCK, MICH.—The Commonwealth Pwr. Co. is extending its system to Comstock to supply electricity for lamps and motors.

IMLAY, MICH.—The Mutual Tel. Co. has secured an option on the system of the Bell Tel. Co. in Imlay City, the transfer to take place April 1. The two exchanges will be consolidated. The exchange building of the Mutual Tel. Co. is being remodeled to provide room for the new switchboard.

KALAMAZOO, MICH.—Preparations are being made for the construction of a municipal electric-light plant. Bids have been obtained on the installation of boilers and electrical equipment and contract for boilers has been awarded. Bids on construction of building will be

asked for as soon as plans and specifications are completed. A site bordering on the Kalamazoo River has been purchased and a plot of land equal to a city block adjoining will be used for a city park. The cost of the plant is estimated at about $115,000. Woodmansee, Sessions & Davidson, of Chicago, Ill., consulting engineers, have charge of the work. C. L. Miller is city clerk.

MONROE, MICH.—The Council has passed an ordinance whereby all telephone, telegraph and electric-light wires are to be placed under ground in certain districts in the city, to take effect Feb. 1.

PORTLAND, MICH.—The village is considering the question of building a new dam 70 ft. below the present municipal dam to provide more power for the electric plant. The cost of the proposed dam is estimated at about $25,000. The proposition will be submitted to a vote in the spring.

SAGINAW, MICH.—The Valley Home Tel. Co. has applied to the State Railroad Commission for permission to issue $100,000 in capital stock.

WYANDOTTE, MICH.—The Worcester Salt Co. is reported to be in the market for a second-hand 65-kw, 125-volt belted generator.

COLD SPRING, MINN.—The Public Service Co., of St. Cloud, is canvassing the village to secure contracts for electrical service with a view of extending its service to Cold Spring.

ROCHESTER, MINN.—At a mass meeting held recently the citizens indorsed the proposition of the Zumbro Pwr. Co. to build a 50-ft. dam at Zumbro Falls and to furnish electricity to the city of Rochester at 2¼ cents per kw-hr. for the first 1,000,000 kw-hr. per year and at 1¼ cents per kw-hr. for all used above that amount, the minimum contract price to be $32,000. H. A. Christensen, Charles Armstrong and J. M. Norton, of Rochester, are interested in the Zumbro Pwr. Co.

WESTBROOK, MINN.—The installation of an electric-light and heating plant in Westbrook is under consideration. L. P. Pederson and Bert. Milligan are interested in the project.

WAVELAND, MISS.—The Mayor and Board of Aldermen have decided to install an electric-lighting system throughout the city.

KANSAS CITY, MO.—Mayor Jost has authorized plans to be prepared at once for the installation of a municipal electric-light plant on the river front to supply electricity for lighting the streets and for power purposes in the downtown district. The Mayor proposes to call an election immediately after the first of the fiscal year to submit the proposition to a vote.

ST. LOUIS, MO.—The Commerce Pwr. Co. has applied to the City Council for a franchise to supply light, heat and power in the district bounded by Main, Walnut, Ninth and Eleventh Streets.

TRENTON, MO.—The North Missouri Pwr. Co. has filed a petition with the County Court asking for permission to erect electric transmission lines along the highways of Grundy County. The company proposes to transmit electricity direct from the power plant of the Mississippi Pwr. Co. at Keokuk. Energy will be transmitted from its substation at St. Louis to its plant at Hannibal and from there carried on high-tension transmission lines across the State to Brookfield, Chillicothe and Trenton.

PLAINS, MONT.—J. W. Gladden, of the Perma Mercantile Co., has been granted a franchise to erect a telephone line along the public roads through Camas Prairie and vicinity.

ELY, NEV.—The Smoke Valley Devel. Co. is planning to install a small power plant to operate air drills.

WELLS, NEV.—H. H. Cazier and John H. Cazier have received authority from the state engineer to develop the water-power of Trout Creek for power purposes. The proposed plans provide for the erection of a power plant to supply electricity in Wells and eventually in Metropolis; also for the construction of roller flouring mills.

MELVIN VILLAGE, N. H.—Plans are being perfected by George W. Copp, of Melvin Village, to organize a company, to be known as the Tuftonboro El. Lt. & Pwr. Co., for the purpose of furnishing electricity for lamps and motors here. The plant will be operated by water-power.

ROCHESTER, N. H.—The City Council has authorized the electric-light committee to make investigations regarding the installation of a municipal electric-light plant and report at the next meeting of the Council.

ASBURY PARK, N. J.—The report of R. L. Savage, city engineer, to Mayor R. S. Bennett and the City Council relative to improvements to the municipal water-works system recommends the installation of additional electric generating equipment to provide energy for maintaining about 500 100-watt Mazda lamps for the beach front and for operating the ventilating system in the public schools. Mr. Savage recommends the installation of two additional generators, each rated at 200 kva. The cost of installing the generators, including switchboard and all equipment at terminals, is estimated at $15,000. This does not include any feeder wires, lamps or equipment outside of power station.

HADDONFIELD, N. J.—The Borough Council has accepted the proposition of the Keystone Tel. Co. for the installation of a police and fire alarm system.

MORRISTOWN, N. J.—The Morris & Somerset El. Co. has been granted permission by the Hanover Township to extend its transmission line from Morris Plains to Mount Taber. The company, it is said, contemplates asking for a franchise to supply electricity in the borough of Rockaway and other places in that vicinity.

NORTH ARLINGTON, N. J.—The lighting committee of the Borough Council has been instructed to enter into negotiations with the Pub. Ser. El. Co., of Newark, relative to the installation of an electric street-lighting system. North Arlington has not a post office.

ORANGE, N. J.—The building committee of the Common Council has authorized estimates prepared for the cost of extensions to the municipal electric-light plant to enable it to supply electricity for lighting all the public schools and other public buildings in Orange.

SALEM, N. J.—The Board of Public Utility Commissioners has approved the merger of the Salem El. Co., of Salem, and the Gloucester County El. Co., of Pitman Grove, to be known as the El. Co. of New Jersey. The new company has been authorized to issue $24,000 in capital stock and $130,000 in bonds.

TRENTON, N. J.—The Pennsylvania R. R. Co. has broken ground for its proposed new power plant on State Street. A new 55-ft. wide canal bridge is also planned, to be electrically operated.

TRENTON, N. J.—The Delaware River Development Company has been incorporated by Charles C. Wilson, Anna M. Wilson and Mary L. Albertson, of Belvidere. The company is capitalized at $50,000 and proposes to construct dams on the Delaware River at Oxford Township, Warren County and at Upper Mount Bethel, Pa.

DEMING, N. M.—The Home Plot Co. will install 100 electrically operated pumping plants on a tract of 2000 acres near here. Each plant will be capable of irrigating 20 acres.

CLAYVILLE, N. Y.—The Utica Gas & El. Co. is contemplating extending its transmission lines to Clayville in the spring. The company already has a franchise here.

FREEPORT, N. Y.—The Village Board of Trustees has awarded the contract for improvements and extensions to the municipal electric-light plant and water-works to William M. Sheehan & Co., at $17,970. William R. Smith is chief engineer of the plant.

GREECE, N. Y.—Petitions are being circulated among the taxpayers of Greece asking the Town Board to adopt the plan of the Rochester Ry. & Lt. Co. for the installation of an ornamental street-lighting system on West Side Boulevard from the city line to Charlotte, Dewey Avenue Boulevard as far as Barnards, and Ridge Road as far as the Buffalo, Rochester & Pittsburgh Railway tracks. It is proposed to use concrete posts surmounted by ironwork of ornamental design and 200-cp Mazda lamps. About 250 posts will be used. Greece has not a post office.

KINGSTON, N. Y.—The City Council has entered into a contract with the Kingston Gas & Elec. Co. under the terms of which an entire new lighting system will be installed. The present arc lamps along Broadway will be replaced with magnetite-arc lamps erected on ornamental poles of the bishop's crook design. The arc lamps in the residential sections will also be replaced with magnetite-arc lamps. The cost of installing the new system is estimated at about $15,000.

MARATHON, N. Y.—The question of installing a storage-battery outfit at the municipal electric-light plant is under consideration by the municipal water and light commissioners.

MONTICELLO, N. Y.—Arrangements are being made by the New Jersey & New York Pwr. Co. for the construction of a large power plant near Monticello in the near future, to cost from $8,000,000 to $10,000,000. The Town Board of Thompson has granted the company a franchise. The company has applied to the commissioners of the city of Passaic for a franchise to supply electricity for lamps and motors in that city. The first movement will be the construction of a large dam across the Neversink River, which will cost from $3,000,000 to $5,000,000. Below the dam a 3-mile tunnel will be built through the Shawangunk Mountain, near Haven, where the power plant will be located. Electricity generated at the plant will be distributed to towns and villages in New Jersey and New York.

NEW YORK, N. Y.—Sealed bids will be received by the Board of Health, corner of Centre and Walker Streets, New York, N. Y., until Jan. 29 for furnishing material and labor required for additions and alterations to the electric equipment in the department building on the corner of Centre and Walker Streets, borough of Manhattan. Bids will also be received at the same time and place for furnishing and installing lighting fixtures, etc., together with all necessary alterations and other work incidental thereto, for the measles building, on the grounds of the Willard Parker Hospital, at the foot of East Sixteenth Street, borough of Manhattan. Plans may be seen and blank forms and further information may be obtained at the office of the chief clerk of the department. Ernst J. Lederle, Ph.D., is president of the Board of Health.

ELIZABETH CITY, N. C.—Preparations are being made by the city of Elizabeth City to establish municipal electric light and water plants. A bill is being drafted which will be introduced in the Legislature for the purpose of authorizing the town to purchase the present system or build a new one.

RIDGEWAY, N. C.—The Planters' Tel. Co., recently incorporated with a capital stock of $25,000, will erect about 50 miles of line and construct a telephone exchange to cost about $2,500. A. G. Hayer and others are interested in the project.

SNOW HILL, N. C.—The local electric-light plant was recently destroyed by fire, causing a loss of about $10,000. The plant was located at Tyron Marsh, about 2 miles from the town, and was owned jointly by the town and J. F. Dawes. Work will begin at once on the construction of a new power plant within the corporate limits of the town. At present the town is without electrical service.

MINOT, N. D.—Sealed bids will be received by the State Board of Normal Trustees at the office of E. J. Taylor, president, Bismarck, until Feb. 4 for the erection of a fireproof dormitory building on the Normal School Grounds at Minot. Bids will be received at the same time and place for heating, plumbing, wiring, fan ventilation, heat regulation, etc., in accordance with plans and specifications prepared by Haxby & Gillespie, architects, Fargo, N. D. Plans can be seen at the following places: Builders' Exchange, St. Paul and Minneapolis, Minn.; Minot, Grand Forks and Fargo, N. D., and at the office of the architects. Plans can be obtained from the architect upon payment of $10 per set.

STEELE, N. D.—The City Council has granted W. R. Hardy permission to erect transmission lines in Steele for the distribution of electricity for lamps and motors.

BEDFORD, OHIO.—The Cleveland El. Illg. Co., of Cleveland, has been granted permission to purchase the property of the Bedford El. Lt. & Pwr. Co., at $22,500.

CINCINNATI, OHIO.—The Kentucky Motor Sales Co., Reading Road, has engaged Stewart & Stewart, architects, to prepare plans for an electric light and power plant, to cost about $30,000.

CINCINNATI, OHIO.—Plans for an electric light and power plant in the new tuberculosis hospital in Cincinnati have been approved by the Hospital Commission. Tietig & Lee are the architects.

CLEVELAND, OHIO.—Proposals will be received at the office of W. H. Kirby, secretary to the director of public service, No. 104 City Hall, Cleveland, until Jan. 31 for furnishing, erecting and painting structural steel work for the municipal electric-light plant. W. J. Springborn is director of public service.

COLUMBUS, OHIO.—Sealed proposals will be received by B. L. Bargar, director of public safety, City Hall, Columbus, Ohio, until Jan. 29 for furnishing one two-position common-battery telephone switchboard in accordance with drawings and specifications, copies of which are on file in the office of the director of public safety.

DEFIANCE, OHIO.—The Northwestern Tel. Co. has been given permission to purchase the property of the Central Union Tel. Co. at Defiance, at $17,050; also permission to issue $52,540 capital stock, to be sold at par. Part of the proceeds will be used for purchase of the property and the remainder for the construction of a building in Defiance and extensions and improvements to the property.

MARION, OHIO.—Improvements will be made at once to the Marion plant of the Columbus, Delaware & Marion Ry. Co. involving an expenditure of about $25,000. Frank Glosser, superintendent of the lighting department in this city, has been authorized to receive bids for the necessary equipment to increase the output of the local power plant and substation to over 2000 hp. The improvements contemplated include the installation of one 500-kw Curtis turbo-generator, three 250-hp water-tube boilers, with new feed pumps, piping and smokestack; 225-kva condenser driving a 25-kw exciter or a small auxiliary dynamo, 220-kw step-down transformers and an additional 300-kw rotary converter for furnishing power to railway system. Eli M. West, of Columbus, is receiver of the company.

NEWARK, OHIO.—Preliminary surveys are being made for the erection of a transmission line between Newark and Lancaster by which the Licking Lt. & Pwr. Co. will supply electricity for commercial purposes in Lancaster. The erection of a transmission line from Newark to Mount Vernon in the near future is contemplated. The Licking Lt. & Pwr. Co. is building a new power plant in Newark, which will furnish electricity in Lancaster, Mount Vernon and towns and villages along the route of the transmission lines.

PIQUA, OHIO.—The Western Ohio Ry. Co., of Lima, has applied to the City Council for a franchise to supply electricity in Piqua.

RUSHSYLVANIA, OHIO.—The purchase of the local electric-light plant, to be owned and operated by the municipality, is under consideration.

CUSHING, OKLA.—The Cushing El. Lt. & Pwr. Co. will erect an electric light and power plant to supply electricity for lamps and motors in Cushing and Bartlesville. The equipment will consist of one 175-hp Murray Corliss engine, one 150-kw, three-phase, 60-cycle, 2300-volt generator, switchboard, General Electric type transformers, 9 miles of overhead material (No. 6 wire) and tungsten lamps. Contracts have been placed for all equipment. All lighting service will be furnished on a meter basis. Tungsten lamps will be used throughout the system. H. Askin, secretary, has charge of the work.

GOTEBO, OKLA.—Plans are being considered for the installation of an electric-light plant at the Rainey Mount School, for which an appropriation has been asked.

HINTON, OKLA.—An ordinance has been passed authorizing an issue of bonds to the amount of $10,000 for the purpose of installing an electric-light system in Hinton.

PAWNEE CITY, OKLA.—Negotiations are under way between the city officials of Pawnee City and Ralston with a view of furnishing electricity from the Pawnee City municipal plant in Ralston.

BEND, ORE.—The Central Oregon Pwr. Co., which owns the local water, light and power plants, has been granted a franchise by the County Court to erect electric transmission lines along the highways of Crook County. Kempster B. Miller, one of the stockholders of the company, was also granted the privilege of erecting telephones along the county roads.

CORVALLIS, ORE.—The Oregon El. Ry. Co., of Portland, is planning to build a branch from its main line to Corvallis, work on which will soon begin.

EUGENE, ORE.—Plans are being prepared by the Oregon El. Ry. Co. for the development of the Clear Lake project in the Cascade Mountains east of Eugene. The plant when completed will develop 30,000 hp.

MEDFORD, ORE.—J. A. Westerlund and C. Y. Tengwald have applied for a franchise to operate a trackless trolley system in Medford.

MEDFORD, ORE.—The M. P. McInney Realty Co., of Oakland, Cal., has applied for a franchise to construct and operate an interurban electric railway in Medford.

PORTLAND, ORE.—In his annual message to the City Council Mayor Rushlight urges it to make preparation for a municipal lighting system.

PORTLAND, ORE.—The Portland, Eugene & Eastern Ry. Co., of Portland, has announced that it will extend its electric railway to Molalla. The cost is estimated at about $100,000.

PORTLAND, ORE.—A bill will be introduced at this session of the Oregon Legislature providing for developing the water-power of the Columbia River, 2 miles above the lower entrance of the Celilo Canal, where it is estimated that a minimum of 100,000 hp can be developed. The project is to be prosecuted and operated by the States of Oregon and Washington for the benefit of the municipalities of the two States. It is proposed to have the Legislature of the State of Washington appoint a commission to work with the Oregon commission in the development of the enterprise.

ALTOONA, PA.—The Penn Central Lt. & Pwr. Co. has been granted a new charter increasing its capital stock from $1,500,000 to $2,500,000.

BERNVILLE, PA.—The Bernville Lt., Ht. & Pwr. Co. has petitioned for a franchise to install an electric-light plant in Bernville to supply electricity for lighting and commercial purposes.

CARLISLE, PA.—The capital stock of the Carlisle Lt., Ht. & Pwr. Co. has been increased from $5,000 to $500,000.

EASTON, PA.—The City Council has adopted a resolution authorizing a committee to be appointed to secure data and information as to the cost of installing a municipal electric-light plant.

HARRISBURG, PA.—Notice has been filed that application will be made Feb. 3 for charters for the Conemaugh, Richland, Lower Yoder and West Taylor Light Companies by J. W. Blough, R. C. Saylor and H. E. Thompson. The companies, it is understood, are to be subsidiaries of the Citizens' Lt., Ht. & Pwr. Co., which will operate in townships surrounding Johnstown with a view of caring for further growth of its business and enlargement of activities.

HUNTINGDON, PA.—Sealed proposals will be received by the Borough Council until Jan. 31 for furnishing electricity for lighting the streets of the borough for a period of not less than five years or more than 20 years. Further information may be secured on application to the public property committee of the borough of Huntingdon. F. G. Grimison is chairman of the committee.

JOHNSTOWN, PA.—Surveys have been made and practically all of the right-of-way secured for the proposed high-tension transmission line of the Citizens' Lt., Ht. & Pwr. Co., of Johnstown, to supply electricity in Blairsville and Indiana and the towns along the route for lighting and mine operations. It is stated that branches of 5 to 10 miles will be made if necessary to furnish power where desired. The line will be completed by spring.

LANCASTER, PA.—The Governor has approved the merger of seven recently incorporated companies in Lancaster County under the name of the Northern Lancaster El. Co. with a capital stock of $35,000. The companies in the consolidation are the West El. Co., Denver El. Co., Reamstown El. Co., Breacknock El. Co., East Earl El. Co., Terre Hill El. Co. and Ephrata El. Co. Dr. H. S. Dissler, of Denver, is president of the new company.

LANCASTER, PA.—Papers have been filed covering the merger of 13 recently incorporated electric companies of Lancaster County, to be known as the Edison El. Co. of Lancaster. The companies taken over by the new company are: Elizabethtown El. Co., Marietta El. Co., Martic El. Co., Conoy El. Co., Eden El. Co., Conestoga El. Co., Providence El. Co., Ephrata El. Co., Earl El. Co., West Earl El. Co., Upper Leacock El. Co., Strasburg El. Co. and Pequa El. Co.

LANCASTER, PA.—The Conestoga Transmission Co. has been chartered for the purpose of transmitting electricity from the power plant of the Pennsylvania Wtr. & Pwr. Co. at Holtwood, on the Susquehanna, to Engleside, near Lancaster. The Conestoga Transmission Co. has an agreement with the Edison El. Co., of York, and the Conestoga Trac. Co. to erect a steel tower transmission line 15 miles long from the power plant on the river near McCall's Ferry to the Engleside plant, to be completed not later than May 1, 1913. Upon completion of the line it will be taken over under a 999-year lease by the Edison El. Co. and the Conestoga Trac. Co. Contracts for towers and material have been awarded and most of the right-of-way secured.

NEW BRIGHTON, PA.—The Beaver County Lt. Co., a subsidiary of the Tri-State Ry. & El. Co., is planning extensive improvements to its system, involving an expenditure of approximately $60,000 and increasing its output from 50 to 60 per cent. Orders have been placed with the Westinghouse El. & Mfg. Co., of Pittsburgh, for a 1850-turbine engine with consumers, exciters, etc. It is proposed to erect a substa-

tion at Rochester, from which Beaver, Vanport, Bridgewater, Rochester, Monaca and Freedom will be directly served. Another auxiliary station will be erected at Beaver Falls to take care of the local business. A high-tension transmission line will be erected from Falston to Rochester. Three mercury rectifiers to augment the street-lighting service will be installed in the Rochester substation. W. R. W. Griffin, of East Liverpool, Ohio, is general manager of the Tri-State Ry. & El. Co.

NEWVILLE, PA.—The property of the Big Spring El. Co. has been purchased by S. M. Kitzmiller & Co., of Shippensburg.

PHILADELPHIA, PA.—Notice has been filed with the State Department and approval given of the merger of 37 electric companies in Northampton, Lehigh, Luzerne, Pike, Carbon, Berks and other eastern counties into the Lehigh Navigation El. Co. of Philadelphia. The following companies were absorbed: Albion, Beechwood, Blackstone, Diamond, of Washingtn Township; East Allen, Eldon, Equitable of Whitehall Township; Excelsior, of Blainfield Township; Fearne, Gibson, Greenwood, Hazard, Kent, Lehigh, Navigation, Lizard Creek, Lower Mount Bethel, Lower Nazareth, Lower Saucon, Marshall, Mitchell, Moore Township, Nesquehoning, North Whitehall, Oakdale, Orchard, Panther Creek, Primrose, Sharswood, Skidmore, South Whitehall, Standard, of Washington Township; Star, Story, Taney, Upper Macungie, Upper Milford, Upper Mount Bethel and Upper Nazareth Electric Companies. All of these companies were chartered in the last 18 months. The new company is capitalized at $3,370,000 and the officers are: S. D. Wariner, of Philadelphia, president; R. H. Wilbur, of St. Davids, vice-president; H. F. Baker, of Philadelphia, secretary and treasurer.

SCRANTON, PA.—The Scranton El. Co. has been granted a permit to build an extension to its boiler plant. The new building will be 120 ft. by 120 ft., three stories high, of steel and concrete construction.

WARREN, PA.—The Warren Street Ry. Co. will extend its electric railway to Youngsville, a distance of 9 miles, in the spring.

WASHINGTON, PA.—Announcement has been made by the West Penn Trac. Co. of the merger of four electric light and power companies in southwestern Pennsylvania, which became effective the first of the year. The companies are the Washington El. Lt. & Pwr. Co., of Washington; the Canonsburg El. Lt., Ht. & Pwr. Co., of Canonsburg; the Citizens' El. Lt., Ht. & Pwr. Co., of McDonald, and the Waynesburg El. Lt. & Pwr. Co., of Waynesburg. The companies have been merged as part of the West Penn system. It is stated that some of the plants will be discontinued.

EDGEMONT, S. D.—The City Council is negotiating with the Dakota Pwr. Co., of Rapid City, with a view of having the company furnish electricity in this city from its plant on Rapid Creek, 60 miles distant.

BRISTOL, TENN.—The Electric Trans. Co. has awarded contract for the construction of a central electric power plant at the pit mouth, near St. Charles, Va. The company proposes to supply electricity to all operators in the Lee County field. Transmission lines will also be extended to the Toms Creek, Stonega and other districts. Contracts for electrical machinery were awarded to the General El. Co., for condensers to the Wheeler Co., and for boilers to the Babcock & Wilcox Co. Contracts for buildings and for 50 miles of piping and transmission lines will be awarded in the near future. The cost of the entire unit is estimated at about $300,000. Later the transmission lines are to be extended to Bristol and Knoxville and into the Piedmont and Appalachian sections.

DUNLAP, TENN.—The installation of a municipal electric-light plant is contemplated by the city.

DALLAS, TEX.—The Dallas Automatic Tel. Co. is planning to double the capacity of its five exchanges, now having connections for 10,000 telephones.

DALLAS, TEX.—C. H. Alexander, of the Colorado River Pwr. Co., has submitted a proposition to the Board of Commissioners offering to supply electricity to the city of Dallas. It is proposed to furnish from 10,000 hp to 30,000 hp for a period of from 20 to 40 years at the rate of ¾ cent per hp.

DALLAS, TEX.—J. W. Crotty, vice-president and general manager of the Eastern Texas Trac. Co., has announced that contracts for right-of-way for its proposed interurban electric railway from Greenville through Wolfe City to Bonham have been signed and that financial arrangements for construction of the road have been made. It is planned to have the railway finished by September, 1913. The railway will be 68 miles long and will cost about $1,800,000. Orders have already been placed for rolling stock and other equipment. Forest E. White, of Galveston, is president.

EASTLAND, TEX.—The local electric-light plant, owned by A. A. Abney, recently destroyed by fire, will be rebuilt immediately.

GIDDINGS, TEX.—The Giddings Cotton Oil Co. has purchased the local electric-light plant, owned by H. M. Wolters. The company will enlarge and improve the plant.

HONEYVILLE (R. F. D., BRIGHAM CITY), UTAH.—The Town Board is reported to be considering the installation of a municipal electric-light plant.

PARK CITY, UTAH.—The Utah Pwr. & Lt. Co., of Salt Lake City, has purchased the property of the Park City Lt., Ht. & Pwr. Co. and will take over the plant Feb. 1. D. E. King, superintendent of the plant, will be retained as local manager for the new company.

NEWFANE, VT.—Investigations are being made by Albert Phillips for the installation of an electric-light plant in Newfane. If sufficient patronage is guaranteed the plant will be installed.

CHEHALIS, WASH.—G. F. Allen, forest supervisor, Tacoma, Wash., has applied to the Lewis County Commissioners for permission to erect a telephone line along certain county roads near and through the forest reserve in the eastern part of the county.

COLFAX, WASH.—The Inland Tel. & Teleg. Co. has been granted permission to construct and operate lines tapping nearly every city in Whitman County.

KELSO, WASH.—The Commissioners of Diking District No. 1 are working on a proposition to construct a power plant to utilize the power from the falls on Coal Creek to generate power.

KELSO, WASH.—The Commissioners of Cowlitz County have granted the Washington-Oregon Corpn. a franchise to erect electric transmission lines over the county roads from Kelso to Castle Rock. B. M. Watkins is local manager.

MORTON, WASH.—The Morton El. Co. has purchased the property of the Rainey Valley El. Lt. Co. Improvements are contemplated by the new company.

PORT TOWNSEND, WASH.—The Key City Lt. & Pwr. Co., of Port Townsend, has been granted a franchise for a period of 30 years.

PORT TOWNSEND, WASH.—W. B. Webb and associates have been granted a franchise to construct and operate an electric railway system here.

SEATTLE, WASH.—Julius Redelshiemer, of Redelsheimer & Co., is planning to install an electrical heating system in his mansion on Lake Washington.

TACOMA, WASH.—The Tacoma Ry. & Pwr. Co. contemplates an expenditure of about $500,000 on the Electron Project, the work to include the construction of a 10-mile flume and tunnel. The company will soon apply for a franchise to operate across the new Eleventh Street Bridge to the tidelands, the mill and factory district. John A. Shackleford is president.

TACOMA, WASH.—The Puget Sound Pwr. Co. has been granted a franchise by the County Commissioners to erect a high-tension transmission line between Tacoma and Dieringer, a distance of about 12 miles, for the purpose of transmitting electricity from the Lake Tapps power plant.

BLUEFIELD, W. VA.—The Appalachian Pwr. Co. has completed the Pulaski-Radford (Va.) transmission lines. Work has begun on the erection of a transmission line to serve the Flattop Coal Mining Co.

MOOREFIELD, W. VA.—The proposition to issue bonds for the construction of a municipal electric-light plant in Moorefield will be submitted to the voters on Feb. 1.

PARKERSBURG, W. VA.—The officials of the Parkersburg, Marietta & Interurban Ry. Co. are considering plans to develop all of the available water-power of the Muskingum River in Eastern Ohio and are now negotiating with the government for the purchase of water rights and power sites. The company owns the city street-car systems in Parkersburg and Marietta and interurban lines radiating from these cities, operating 55 miles of track, and also furnishes electricity for lamps and motors in its territory. In case power sites are secured on the Muskingum, its system will be operated by hydroelectric power transmitted from its new power stations.

WILLIAMSTOWN, W. VA.—Application has been made to the City Council by S. D. Camden, Henry Archer and associates for a franchise to construct and operate an electric-light system here. B. L. Bullman is Mayor.

EAU CLAIRE, WIS.—Proposals will soon be asked by the City Council for lighting the streets of the city. Both gas and electric lamps will be considered. Under the present contract there are 154 arc lamps used. The new plans provide for 388 street lamps; of these there will be 102 arc lamps, 62 lamps of 80 cp and 224 lamps of 60 cp. Besides the 388 lamps, there will be thirteen lamps of 60 cp and six of 80 cp to be erected on the various bridges.

MADISON, WIS.—The Wisconsin Tel. Co. will place its wires in Madison in underground conduits next spring. The cost of the work is estimated at about $90,000.

COWLEY, WYO.—The Wyoming El. Lt. Improvement Co. is planning to furnish electrical service in Cowley, Worland and Gillette. It is proposed to install an electric power station in each town. The equipment for the Worland station consists of two 80-hp boilers, 80-hp engines and a 60-kw General Electric generator, Weston alternating-current switchboard instruments and oil switches, two 15-kw, one 10-kw, five 2-kw and three 1-kw transformers, 10 miles of primary No. 6 weatherproof copper wire, 84 cedar poles, 25 ft. long; 2500 ft. of underground distributing system for series street-lighting system, 500 tungsten lamps, 100 Fort Wayne meters. A 40-hp gas engine will be used in the Cowley station. Plans for the Gillette power station are not yet completed. Ernest G. Ditto, of Worland, has charge of the work. The officers are: Frank Ditto, president; H. A. Boyles, vice-president, and J. W. Wheeler, secretary and treasurer.

DUNCANS, B. C., CAN.—Plans have been completed for the construction of a hydroelectric power plant in Duncans, to cost about $45,000. Dutcher, DuCane & Co., Rogers Building, Vancouver, are engineers.

KAMLOOPS, B. C., CAN.—The city of Kamloops has authorized an expenditure of $125,000 for a new steam power plant, $20,000 for hydro-electric substation and equipment and $10,000 for water-works. Dutcher, DuCane & Co., Rogers Building, Vancouver, are engineers. The contract for construction of new power plant has been awarded to C. C. Moore & Co., Mutual Life Building, Seattle, Wash., at about $100,000.

LADNER, B. C., CAN.—The Vancouver Pwr. Co. will erect an electric transmission line from the water-works in East Delta to supply Ladner and this section with electricity for lamps and motors while the high towers for the wires over the Fraser River are being restored.

NANAIMO, B. C., CAN.—The Nanaimo El. Lt. & Pwr. Co. will apply for a license to take 150 ft. per second, in addition to its present record, from Mill River. The water will be used for generating electricity to be distributed in the city of Nanaimo and territory within a radius of 15 miles.

REVELSTOKE, B. C., CAN.—The City Council has decided to install an arc-lighting system, covering a distance of about 2 miles.

VANCOUVER, B. C., CAN.—The British Columbia El. Ry. Co. is contemplating making alterations to its transmission system on the lower mainland of British Columbia to provide for an improved central service covering its large territory in that section. At present its transmission lines carrying 40,000 volts run from the generating station on the north arm of Burrard Inlet to substations at Burnaby and Vancouver. The new plans contemplate the erection of a large receiving station near Esmond Avenue, Burnaby, along the route of the Burnaby interurban railway. Energy will be transmitted to this station from the North Arm power house at 60,000 volts and connections established from the central point with various substations, a loop system being formed so that alternate sources of power will be available at each point in case of accident to any part of the lines. The proposed work will involve the reconstruction of the present pole line from Lake Buntzen, equipping the new lines with 60-ft. poles, carrying metal cross-arms and disk insulators of the suspended type.

DALHOUSIE, N. B., CAN.—The by-law authorizing an appropriation of $30,000 for the installation of an electric-light plant has been approved by the voters. Willis Chipman, of Toronto, Ont., has been engaged by the town to prepare plans and specifications for the proposed plant.

YARMOUTH, N. S., CAN.—The Yarmouth Lt. & Pwr. Co., recently incorporated, will take over the property of the Yarmouth El. Co. and the Yarmouth St. Ry. Co. The officers of the new company are: Willard M. Kelley, president; Edgar K. Spinney, vice-president; John T. Murphy, of Halifax, managing director, and James Graham, resident manager and general superintendent.

ESSEX, ONT., CAN.—The town of Essex has entered into negotiations with the Ontario Hydro-Electric Commission for a supply of Niagara power when the western transmission line is extended to Windsor. Several other towns along the route are expected to take action within a short time.

NORTH BAY, ONT., CAN.—The Hydro-Electric Power Commission of Ontario is negotiating with the Nipissing Pwr. Co., of Nipissing, with a view of taking over the plant of the power company on the South River, about 25 miles from North Bay, in behalf of the town of North Bay. Some time ago a by-law was passed by the town of North Bay authorizing an expenditure of $60,000 for the installation of a municipal electric plant.

PARRY SOUND, ONT., CAN.—The ratepayers have passed a by-law authorizing an extension to the municipal electric-lighting system.

WELLAND, ONT., CAN.—The Town Council has given its approval of the purchase of the plant of the Ontario Pwr. Co. in Welland as part of the new hydroelectric lighting system. The cost of the distributing system and substation of the Ontario Pwr. Co. is placed at $26,250.

MONTREAL, QUE., CAN.—The Laurentide Pulp & Paper Co. has recently purchased a water-power on the St. Maurice River, capable of developing 25,000 hp. The company now has an available development of 70,000 hp. Work has been started on developing the water-power adjacent to the company's plant.

WESTMOUNT, QUE., CAN.—Orders have been placed by the Municipal Electric Light Department with the General El. Co. for 50 magnetite arc lamps. It is proposed to erect 100 additional lamps in the spring.

PRINCE ALBERT, SASK., CAN.—Tenders will soon be asked for construction of penstock, canal excavations, tailrace excavations and concrete work, etc., in connection with a hydroelectric power plant at La Colle Falls to develop 15,000 hp. C. H. and P. H. Mitchell are engineers.

REGINA, SASK., CAN.—Sealed tenders will be received by the City Commissioners of Regina, Sask., until Feb. 24 for furnishing track and trolley material for the municipal railway as follows: Contract D—For rails and miscellaneous track material. Contract E—5400 4/0 standard copper rail bonds, 10⅛-in. C.C.; 3400 4/0 standard copper rail bonds, 13-in. C.C.; 630 4/0 solid copper rail bonds, 62-in. C.C.; 60 4/0 solid copper rail bonds, 72-in. C.C. Contract F—10,000 standard sawn square British Columbia fir railroad ties, 6 in. by 8 in. by 7 ft.; 35,000 standard sawn square British Columbia fir railroad ties, 6 in. by 8 in. by 8 ft.; 1250 Western cedar poles, 30 ft. long, 7-in. top. Contract G—20,000 barrels Portland cement. Contract H—21 miles 2/0 hard-drawn trolley wire; 12 miles 4/0 D.B.W.P. 19-stranded copper wire; 4 miles 2/0 D.B.W.P. 7-stranded copper wire; 10 miles ¾-in. stranded soft-drawn iron wire. Contract J—Insulators, hangers, brackets, pullovers, turnbuckles, trolley frogs, crossovers, clinch ears, pole line, hardware, etc. All material to be delivered f.o.b. Regina and duty paid. Copies of specifications, schedules, delivery dates and form of contract and other information may be obtained upon application to H. Doughty, superintendent of the Regina municipal railway. R. Martin, Mayor; G. A. Mantle and L. A. Thornton are city commissioners.

WILKIE, SASK., CAN.—By-laws to appropriate $10,000 for extensions to municipal electric power plant and $2,250 for extensions to street-lighting system were passed recently.

SAN LUIS POTOSI, MEX.—The City Council is considering the question of installing a municipal electric-light plant. The city's contract with the Central Mexican Lt. & Pwr. Co. has expired and, it is said, will not be renewed.

SAN LUIS POTOSI, MEX.—Messrs. Hoogwhingel, Anthony, Brown & Co., of London, Eng., have acquired the street-railway systems of San Luis Potosi, Leon Guanajuato, Torreon and Tampico. This firm is said to be a subsidiary of S. Pearson & Son, Ltd., which has large holdings in Mexico. The street-car lines in all cities are to be reconstructed and converted for electric traction. The work has already been started in San Luis Potosi and preparations are being made to begin similar work in the other cities. G. H. Hoogwhingel is now here directing the work.

New Industrial Companies

THE ELECTRIC SALES COMPANY, of Detroit, Mich., has been incorporated with a capital stock of $10,000 by Edwin L. Crosby, Alex Dow and John Breman.

THE FEDERAL ENGINEERING COMPANY, Ltd., of Toronto, Ont., Can., has been incorporated with a capital stock of $500,000 to manufacture and deal in electrical machinery, appliances, plants, etc.

THE RUTZEN POWER COMPANY, of Cleveland, Ohio, has been incorporated with a capital stock of $100,000 for the purpose of controlling patents of the Rutzen motor and to manufacture said motor. The incorporators are: D. W. Colvin, Francis J. Peck, D. M. Tilden, Alonzo M. Snyder and M. I. Young.

THE SHEFFIELD GAS ENGINE COMPANY, of Kansas City, Mo., has been incorporated with a capital stock of $150,000 by Fred D. Whiting, Freeman Field and Harris Robinson.

THE SPECIAL ELECTRIC COMPANY, of Chester, Pa., has been organized for the purpose of manufacturing a device for keeping trolley poles from slipping off the wire. The officers are: R. F. Coleman, president; C. W. Gorsuch, treasurer, and H. V. Smith, secretary.

THE STATE ELECTRIC COMPANY, LTD., of Walkerville, Ont., Can., has been formed for the purpose of manufacturing electric commercial vehicles. The directors are: H. Timmins, N. A. Timmins, W. S. Hutchinson, C. E. Archibold and S. Carsley, all of Montreal, Que.; A. O. Tate, D. A. Dunlap, of Toronto, Ont. Albert Klatschmidt, of Detroit, Mich., has been appointed manager of the factory.

THE C. H. WARNER COMPANY, of Cleveland, Ohio, has been incorporated with a capital stock of $15,000 for the purpose of installing plumbing, steam and gas fittings, electric wiring and heating systems, etc. The incorporators are: C. H. Warner, D. B. Sommers, M. A. Warner, S. C. Kellie and Julius P. Preyer, all of Cleveland.

New Incorporations

PRAIRIE GROVE, ARK.—The Farmers' Mutual Tel. Co. has been incorporated with a capital stock of $10,000. The officers are: J. M. Covett, president, and A. N. Dean, secretary and treasurer.

DIETRICH, ILL.—The Union Tel. Co., of Elliottstown, has been incorporated with a capital stock of $5,000 to operate a telephone system. The incorporators are: F. M. Haynes, John W. Dobbins, W. H. Endebrook, J. S. Sipes and William Poe.

ROSSVILLE, ILL.—The Rossville Tel. Co. has been incorporated with a capital stock of $40,000 by Perry M. Warner, Charles W. Warner and Fred L. Draper.

ALEXANDRIA, IND.—The People's Pwr. & Lt. Co. has been incorporated with a capital stock of $500,000 by C. M. C. Shank and others.

TERRE HAUTE, IND.—The Springfield (Ill.) & Central El. Trac. Co. has filed articles of incorporation with the Secretary of State. The initial capital stock is placed at $50,000. The company proposes to build and operate a traction line from the Indiana-Illinois State line to Terre Haute; also to supply electricity for lamps and motors to towns, cities and coal mines along the line. Isaac A. Smith, George W. White and A. C. Skillman, all of St. Louis, Mo., are directors.

ELIZABETHTOWN, KY.—The Tygert Valley Wtr. Pwr. & El. Co. has been incorporated with a capital stock of $20,000 by D. H. Hall, W. F. Carter, George Snider and W. W. Carter.

ST. LOUIS, MO.—The Missouri Public Utilities Co. has been incorporated with a capital stock of $1,000,000 to operate light, power, gas and ice plants and electric railways in Southeast Missouri. The company has acquired plants in Charleston, Sikeston, Ill., and Fornfelt, Mo., and is negotiating for several more. It will build a large central electric plant, to cost about $500,000. The incorporators are: Hugo Wurdack, president of the Lt. & Devel. Co., Wright Building, St. Louis; H. W. Beck, W. A. Smith and others.

ELKO, NEV.—The Elko-Lamoille Pwr. Co. has been incorporated with a capital stock of $100,000 by J. G. Scrughan, of Reno; Frank Fernald, Sr., Webster Patterson, H. S. Taber, L. J. Wintermantel and B. G. McBride.

BRIDGEPORT, OHIO.—The Belmont El. Co. has been incorporated with a capital stock of $10,000 to supply electricity for lamps, heaters and motors. The incorporators are: J. C. Dent, A. C. Barnum, L. W. Heimlein, W. E. Thoma and J. E. Fox.

EBENSBURG, PA.—The Springfield Lt., Ht. & Pwr. Co. has been granted a charter with a capital stock of $5,000. This company is promoted by parties who are interested in the Springfield Coal Co., operating at Nant-y-Glo, and represents the incorporation of its electric plant so that it can furnish electricity for commercial purposes should it choose to do so.

HARRISBURG, PA.—Charters have been granted by the State Department to the Providence, Eden, Paradise and West Lampeter Electric Companies. Each company is capitalized at $5,000.

HERSHEY, PA.—The Hershey El. Co. has been incorporated with a capital stock of $5,000 for the purpose of supplying electricity in Derry Township. M. S. Hershey is president.

CLARKSVILLE, TEX.—The Clarksville Tel. Co. has been incorporated with a capital stock of $25,000 by W. M. Bloxham, A. C. Stuart, R. B. Harrison and J. F. Rochelle, all of Texarkana.

JEFFERSON, TEX—The Jefferson Ice & Lt. Co. has been incorporated with a capital stock of $30,000 by D. C. Driskell, W. M. Driskell and M. M. Benfield.

TEMPLE, TEX.—The Temple El. Co. has been incorporated with a capital stock of $4,000 by James Ferguson, C. A. Hughes and J. E. Love.

BRISTOL, VA.—The Electric Transmission Co. has been incorporated with a minimum capital stock of $300,000; maximum, $500,000. The officers are: Guy Darst, president; Fred Dulaney, vice-president, and S. E. Puckett, secretary, all of Bristol.

TONASKET, WASH.—The People's Tel. & Pwr. Co., organized by the stockholders of the Tunk Valley Tel. Co., has applied for a franchise in Tonasket for a period of 50 years. The company is capitalized at $15,000. J. H. Green is president of the company.

HUNTINGTON, W. VA.—The Tri-State Pwr. & Milling Co. has been incorporated with a capital stock of $600,000 by C. L. Stearnes, R. W. Kline, of Salem, Va.; H. M. Fox, of Roanoke, Va.; Z. T. Vinson and A. E. Bush, of Huntington. The company has purchased water-power rights along the New River in Summers, Mercer and Monroe Counties, West Virginia, and Giles County, Virginia, capable of developing from 50,000 hp to 60,000 hp. It proposes to build a hydroelectric plant and transmission system to distribute electricity in West Virginia, Kentucky and Ohio. Plans have not yet been decided upon. C. L. Stearnes is president of the company.

VICTORIA, B. C., CAN.—The Telkwa Lt. & Pwr. Co., Ltd., has been incorporated with a capital stock of $500,000 to do a general light and power business, with head office in Victoria.

BOTHWELL, ONT., CAN.—The Florence Pwr., Lt. & Milling Co., Ltd., has been incorporated with a capital stock of $5,000 for the purpose of generating and distributing electricity.

TORONTO, ONT., CAN.—The Venezuela El. Lt. Co. has been chartered with a capital stock of $1,500,000 by J. S. Lovell and R. Gowans.

WINDSOR, ONT., CAN.—The Essex County Lt. & Pwr. Co. has been incorporated with a capital stock of $500,000 by W. A. J. Case, J. B. Case and C. G. Lynch, of Toronto.

Trade Publications

DYNAMOMETERS.—Bulletin No. 505, published by the Diehl Manufacturing Company, Elizabethport, N. J., illustrates and describes its electric absorption dynamometer.

ELECTRIC DRILLS.—High-power universal portable electric drills are made the subject of Bulletin U-7 recently issued by the Standard Electric Tool Company, Cincinnati, Ohio.

CHURCH ILLUMINATION.—The National X-Ray Reflector Company, Chicago, Ill., has issued a bulletin on scientific church illumination, illustrating installations of its "Eye Comfort" system.

PNEUMATIC COMPRESSORS.—The design and construction of "Chicago Pneumatic" compressors are dealt with in Bulletin No. 34 F, issued by the Chicago Pneumatic Tool Company, Chicago, Ill.

FORGE BLOWERS.—The Emerson Electric Manufacturing Company, St. Louis, Mo., is distributing Bulletin No. 3313, which supersedes No. 3311, referring to its directly connected electric forge blowers.

COPPER.—"Copper History" is the self-explanatory title of a four-page folder being distributed by the Rome Wire Company, Rome, N. Y. It gives the monthly average of prices of copper from 1883 to 1913.

COMMUTATOR CEMENT.—Folder 4247, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., covers the use of commutator cement for repairing commutators and also directions for using it.

ILLUMINATION.—A sixteen-page pamphlet has been issued by the National X-Ray Reflector Company, 247 Jackson Boulevard, Chicago, entitled "Greatest Efficiency in Reflection of Light." It deals with the X-ray system of lighting.

AUTOMOBILE SUPPLIES.—"Light Your Way by Electricity" is the title of a folder issued by the Cleveland Storage Battery Manufacturing Company, St. Louis, Mo., which gives brief, illustrated descriptions of its lamps, storage batteries and other specialties.

GALVANOMETER.—A new type of portable galvanometer being placed on the market by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., is made the subject of Bulletin No. 240, which describes this instrument and gives directions for its use.

MOTORS.—Leaflet 3540, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., deals with its synchronous motors for 60 cycles, two-phase and three-phase circuits, various voltages, and from 30 hp to 250 hp in rating. A fully illustrated description of the various parts is given.

FROM GAS TO TUNGSTEN-FILAMENT LIGHTING.—Bulletin No. 11, a November publication of the Delta-Star Electric Company, 617 West Jackson Boulevard, Chicago, has for its subject "Gas Street Lighting Transformed to Series Mazda Lighting." It briefly describes the Pittsburgh Delta-Star series system of 80-cp units on gas-lamp poles.

GLOBES.—Adam Globes for direct and semi-indirect lighting are made the subject of Catalog No. 22, recently brought out by the Phoenix Glass Company, New York. The soft paper, free from glare, the brown ink and the dignified cover make a harmonious combination fittingly adapted to advertise the globes and bowls made by the company.

ELECTRIC FANS.—The General Electric Company has issued its 1913 catalogue of electric fans, known as publication A 4065. It shows the company's fixed and oscillating desk and bracket fans and also its ceiling and ventilating fans. Wiring devices for use in connection with fans, as well as a list of supply parts for all fans, are also enumerated.

ELECTRIC LAUNDRY EQUIPMENT.—The Hurley Machine Company, Clinton & Monroe Streets, Chicago, Ill., is distributing an attractive, illustrated catalog of thirty-two pages, describing its complete line of thirty-six different styles and sizes of Thor electric home laundry machines, including washing machines, ironing machines and clothes driers.

LAMPS.—The National Electric Lamp Association, Cleveland, Ohio, has recently brought out two new bulletins. Train-lighting lamps furnish the subject matter for Bulletin 10 C. Bulletin 8 D contains data on miniature and low-voltage lamps for automobiles and general battery, novelty battery and low-voltage lamps. Both publications are fully illustrated.

MOLDED INSULATION.—The Northern Industrial Chemical Company, 68 Northampton Street, Boston, Mass., after an investigation of more than two years has developed an insulating compound—"Roxite"—a heat-resisting insulating compound which can be molded into any form. In a recently issued booklet are shown illustrations of the various forms into which this new material can be molded.

ELECTRICAL APPARATUS AND AUTOMOBILE ACCESSORIES.—The Holtzer-Cabot Electric Company, Brookline, Mass., assembles in its Catalog No. 4151 various bulletins that have recently been issued on this company's electrical apparatus and automobile accessories. These include among other things interior telephones, wiring specialties, carburetors, lighting generators for automobiles, telephone and wireless telegraph receivers, lightning arresters, magneto generators and other equipment, which are illustrated and briefly described.

LAMP STANDARDS, MAST ARMS AND BRACKETS.—The Electric Railway Equipment Company, Cincinnati, Ohio, has issued a catalog of sixty-two pages, which illustrates one-lamp, three-lamp and five-lamp ornamental standards, combination railway and lighting poles, lighting fixtures arranged for incandescent lamps or brackets for supporting ornamental luminous arc lamps, special columns for supporting ornamental luminous arc lamps, railway poles for ornamental crooks for supporting arc lamps, ornamental brackets for incandescent lamps, and mast arms.

INDUCTION MOTOR OPERATION.—The Fairbanks-Morse Electrical Manufacturing Company, Indianapolis, Ind., is distributing an ingenious device—called the Fairbanks-Morse Current-O-Scope, which shows by means of the vector diagram the relation of the instantaneous values of an alternating current in a three-phase circuit, and by a simple mechanical device indicates how these currents combine in the windings of a three-phase motor to produce the phenomenon of the revolving field. The device shows the principle upon which the induction motor operates in a simple, graphical manner, and by a better method than that presented in textbooks. It consists of two pieces of celluloid, 3 in. by 3 in., in the center of which is a circular piece, with saw edges, on which are printed in colors various arrows for showing the direction and values of the currents, the whole being inclosed in a leather case.

Business Notes

W. T. McCASKEY & COMPANY, of Lansing, Mich., engineers, builders and operators of electric-service and water-works plants, have opened an office in Chicago at 725 Monadnock Building in charge of Mr. Irwin D. Groak.

THE M. W. DUNTON COMPANY'S cash prize for the agent sending in the largest amount of orders for Nokorode soldering paste in the last quarter of 1912 was won by Mr. W. T. McDowell, New York sales manager of the company. A similar prize has been offered for the current quarter.

ALFRED GRAHAM & COMPANY, St. Andrews Works, Crofton Park Road, S. E., London, have mailed to many of their friends in this country a useful leather-bound desk pad complete with blotting sheets, calendar, memoranda space, etc. The Graham company manufactures patent loud-speaking telephones for communication in mines, collieries, fortifications, naval and mercantile vessels, etc.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JAN. 14, 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,050,094. TROLLEY WHEEL; C. F. Bettmann, New Albany, Ind. App. filed Aug. 31, 1911. Lubrication of a multi-part wheel.

1,050,101. TELEPHONE SWITCHBOARD; P. C. Burns, Chicago, Ill. App. filed Jan. 18, 1909. Details of a jack and drop.

1,050,104. DIFFERENTIAL-MICROPHONE REPEATER; J. J. Comer, Chicago, Ill. App. filed Oct. 24, 1910. Variable leverage with adjustment.

1,050,105. ELECTRICALLY HEATED OVEN CONSTRUCTION; L. G. Copeman, Flint, Mich. App. filed July 28, 1911. Shield and drip trough.

1,050,143. TROLLEY; J. Kinzey, Pittsburgh, Pa. App. filed March 19, 1912. Lateral running wheels.

1,050,163. TELEGRAPHIC-TAPE-PERFORATING APPARATUS; J. P. O'Donohue, East Orange, N. J. App. filed Dec. 4, 1911. Intermittent feed.

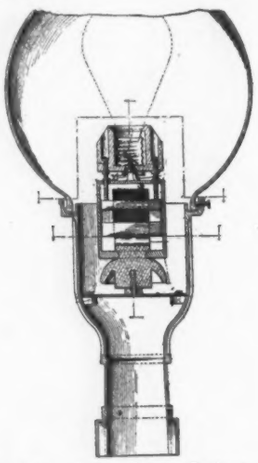
1,050,189. ELECTROMETALLURGICAL FURNACE; J. Westly, Sulitjelma, Norway. App. filed May 1, 1912. Resistance type with sloping bottom.

1,050,196. INSULATING SUPPORT FOR LAMP SOCKETS AND REACTANCE COILS; H. W. Young, Chicago, Ill. App. filed July 22, 1912. For attachment to a hollow pole or post.

1,050,203. CONTROLLER FOR ELECTRIC SIGNS; E. H. Bickley, Detroit, Mich. App. filed July 15, 1911. Controlled by a slotted ribbon.

1,050,211. ELECTRIC SWITCH; M. Guett, Hartford, Conn. App. filed Nov. 3, 1911. Push-button or door-operated.

1,050,223. SURFACE-CONTACT ELECTRIC TRACTION SYSTEM; E. A. Mitchell, Carshalton, Eng. App. filed May 19, 1908. Magnetically operated switch.



1,050,196.—Insulating Support for Lamp Sockets and Reactance Coils.

1,050,228. ELECTRIC ALARM SYSTEM; R. H. Olley, Syracuse, N. Y. App. filed Feb. 20, 1911. Combination with residence lighting circuit.

1,050,239. ELECTRICALLY OPERATED SOUND PRODUCER; C. J. Schwarze, Adrian, Mich. App. filed July 28, 1911. Electromagnetically operated diaphragm.

1,050,250. ALTERNATING-CURRENT CABLE DISTRIBUTING SYSTEM; A. E. Tanner and E. A. Claremont, Manchester, Eng. App. filed April 8, 1910. Plural strand conductor.

1,050,255. PROCESS OF HYDROELECTRIC SMELTING; A. Tommasini, New York, N. Y. App. filed Aug. 1, 1912. Hydrogen reduction process.

1,050,260. OZONE GENERATOR; A. E. Walden, Baltimore, Md. App. filed Oct. 23, 1912. Concentric tube circulation.

1,050,280. THERAPEUTIC BELT; C. A. F. Krüger, Griefenhagen, Germany. App. filed Oct. 11, 1912. Has a plurality of electromagnets and a battery.

1,050,303. ARTICLE FOR ELECTROLYTICAL PURPOSES; B. Schwerin, Frankfort-on-the Main, Germany. App. filed Feb. 17, 1911. The diaphragm of molded carborundum.

1,050,304. TELEPHONE TRANSMITTER; C. E. Scribner, Jericho, Vt. App. filed July 27, 1910. An electrode yieldingly held against the diaphragm.

1,050,328. IGNITING GAS BURNERS; C. F. Arnhorst, Chicago, Ill. App. filed Jan. 19, 1912. For igniting a series of burners.

1,050,372. ELECTRIC AIR-HEATING DEVICE; F. P. Mies, Chicago, Ill. App. filed Jan. 25, 1910. Electrically heated blower casing.

1,050,404. TELEPHONE FIXTURE; W. C. Ude, West Haven, Conn. App. filed May 3, 1912. Receiver hinged to the transmitter.

1,050,431. REGULATING APPARATUS; D. H. Darrin, New York, N. Y. App. filed Feb. 7, 1908. Damper temperature regulator.

1,050,444. ALTERNATE-CURRENT MOTOR; V. A. Fynn, London, Eng. App. filed Feb. 11, 1908. Starting and operating induction motors.

1,050,445. ALTERNATE-CURRENT MOTOR; V. A. Fynn, London, Eng. App. filed May 26, 1910. Commutatorless single-phase induction motor.

1,050,468. ELECTRIC TRACTION SYSTEM AND MOTOR TO BE USED THEREWITH; K. de Kando, Budapest, Austria-Hungary. App. filed May 25, 1905. Combination of direct-current and polyphase motor with poleless field magnet.

1,050,493. AUTOMATIC HIGH-VOLTAGE CIRCUIT-BREAKER; E. O. Schweitzer and N. J. Conrad, Chicago, Ill. App. filed March 18, 1910. Oil-submerged fuse.

1,050,497. MOTOR-CONTROL SYSTEM; E. W. Still, Milwaukee, Wis. App. filed May 29, 1911. For urban and interurban cars. (Seventy claims.)

1,050,503. MAGNETO CONSTRUCTION; B. Whelchel, Indianapolis, Ind. App. filed May 12, 1911. Rigid framework.

1,050,513. BELL ATTACHMENT FOR PIANOS AND THE LIKE; D. W. Barton, Oshkosh, Wis. App. filed Oct. 25, 1911. Auxiliary keyboard.

1,050,514. TELEPHONE-CALL INDICATOR; B. L. Behrendt, Newark, N. J. App. filed Feb. 14, 1912. Indicator for telephone bell or buzzer.

1,050,520. KEY SHELF AND BASE; E. B. Craft, Hackensack, N. J. App. filed May 9, 1910. Longitudinally adjustable key base.

1,050,532. PARTY-LINE TELEPHONE SYSTEM; B. C. Groh, Trenton, N. J. App. filed March 21, 1904. Intercommunication controlled by the operator.

1,050,554. MOTOR-CONTROLLING APPARATUS; D. L. Lindquist, Yonkers, N. Y. App. filed July 6, 1907. Frictional-driving traction elevators.

1,050,563. ELECTRICAL MEASURING INSTRUMENT; F. W. Roller, East Orange, N. J. App. filed July 13, 1908. Ammeter shunt.

1,050,592. CIRCUIT CONTROLLER; J. M. Anderson, Boston, Mass. App. filed June 19, 1909. Wall-type breaker with auxiliary contacts.

1,050,643. OVERHEAD CONSTRUCTION FOR ELECTRIC RAILWAYS; E. E. Gilmore, Philadelphia, Pa. App. filed July 18, 1907. Balanced strain switching guying.

1,050,652. TROLLEY HEAD; R. F. Henne, Mamaroneck, N. Y. App. filed March 21, 1911. Transversely movable wheel.

1,050,662. METHOD AND MEANS FOR PRINTING TELEGRAPHY; I. Kitsee, Philadelphia, Pa. App. filed April 3, 1909. Group system with polarized relay and unbiased armature.

1,050,663. ELECTRIC TRANSMISSION OF INTELLIGENCE; I. Kitsee, Philadelphia, Pa. App. filed March 3, 1906. Combined telephone and telegraph.

1,050,664. TELEGRAPHIC TRANSMITTER; I. Kitsee, Philadelphia, Pa. App. filed March 31, 1909. Two polarized relays and transformers.

1,050,694. ELECTRICAL MEASURING INSTRUMENT; F. W. Roller, East Orange, N. J. App. filed July 15, 1907. Air-cooled shunt.

1,050,728. METHOD OF SIGNALING; R. A. Fessenden, Washington, D. C. App. filed July 27, 1905. Signals are produced by changes in frequency.

1,050,735. METHOD OF PRODUCING METALLIC PRODUCTS FROM IRON ORE; H. L. Hartenstein, Constantine, Mich. App. filed March 9, 1907. Carbon monoxide is used to aid the partial reduction of the following charge.

1,050,736. METHOD OF PRODUCING METALLIC PRODUCTS FROM IRON ORE; H. L. Hartenstein, Constantine, Mich. App. filed March 9, 1907. Flue dust or highly comminuted iron ore is reduced in stages.

1,050,740. ELECTRIC SWITCH; C. E. Knowlton, Rochester, N. Y. App. filed May 31, 1912. Flush wall switch.

1,050,750. ELECTRIC MOTOR; O. H. Pieper, Rochester, N. Y. App. filed Oct. 26, 1905. Series type alternating-current motor.

1,050,777. PHONOGRAPHIC WIRELESS TELEPHONE; A. F. Collins, Newark, N. J. App filed March 18, 1909. Slot machine for public amusement.

13,510 (reissue). ELECTRODE; T. H. Dempster, Schenectady, N. Y. App. filed Dec. 9, 1912. (Original patent No. 976,990, Nov. 29, 1910.) Sectional flaming-arc construction.